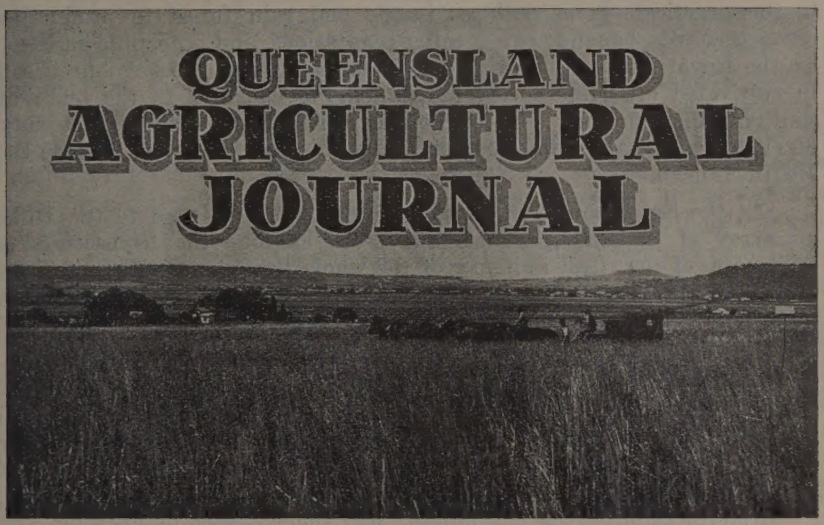
ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



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Event and Comment.

The Royal Visit.

AN outstanding impression of the visit of His Royal Highness the Duke of Gloucester—one of the most notable events of the month of December—was his keen interest in country life, its industries, and its people. At Terrica he saw something of station life and work among sheep and cattle, and of the high standards attained in the several branches of animal husbandry as practised in Queensland, and of which Terrica provided typical examples. The temperate fruit lands of Stanthorpe and their evidence of skilful farming as applied in modern orchard practice had also an especial interest for the Duke. The blood stock studs near Warwick and the vast wheatfields of the Darling Downs attracted his close attention, while the lucerne lands of the Lockyer—a glorious picture after recent rains—and the wealth of the parallel dairy and diversified farming country also obviously impressed him. At the Queensland Agricultural High School and College at Gatton the Royal visitor met future leaders of rural industry in Queensland at a big parade of students, of whom 282 are in residence. The college and its curriculum embracing the science and practice of agriculture and animal husbandry plainly impressed His Royal Highness, and in subsequent conversation with His Excellency the Governor, Sir Leslie Wilson, he expressed his pleasure and great interest in what he had seen. At

Buderim, too, the Duke found much to interest him during the following week-end in the highly cultivated fruits of that rich region, which within a single generation of Queenslanders has emerged from the primitive to the practical—from pathless jungle and rain forest to productive citrus orchards, banana groves, coffee plantations, and pineapple gardens. To the Royal visitor, these rich fruit lands and their cocoa-coloured soil in cultivated orderliness vied in challenging charm with the brilliant sunlight, the tumbling surf on golden beaches, and the scenic beauty of misted mountain, wild woodland, and the open ocean as blue as the Mediterranean.

At the Showground in Brisbane there was presented to the Duke an array of primary products and stock exhibits that constituted a microcosm of the rural industry of the whole State, and with which the Duke was no less impressed. In his reply to the address of welcome, he said to a large assemblage of farmers and other citizens:—

> "I thank you for the words in which you have expressed sentiments of loyalty to the King, my father, on behalf of your members, who include men and women engaged in every form of agricultural and industrial activity in this great State. The King, as a farmer and stockbreeder himself, will greatly appreciate these assurances of loyalty, coming as they do from fellow farmers across the world, whose exhibition he has himself had the pleasure of opening.
>
> "I am glad to be the fourth member of my family to be the guest of your association, and I am most grateful for the cordial welcome and hospitality which you have extended to me to-day. I have been much interested by your record of the association's activities and products, and of the extent to which those products are disposed of within the Empire. This wonderful arch shows me not only their variety and range but their quality, and it enables me to realise more clearly that this is a State of great achievement and of even greater promise. I only wish that time permitted of my seeing all the districts whose products are exhibited here, and of personally offering to the producers my congratulations and good wishes. I ask you to do so on my behalf, and I assure you that I shall carry away from Australia very pleasant recollections of my visit here to-day."

A Great Work.

AT the Diploma Day function of the Queensland Agricultural High School and College, His Excellency the Governor, Sir Leslie Wilson, said that he regarded the college as the most important educational institution in the State. He emphasised that to Queensland agriculture was of vital importance. From the earliest days agriculture had been the foremost of the industries of the world. Those who went on the land to-day were gaining a fine and full life and a realisation that they were doing men's work—a work well worth doing; a great work for their State, country, and Empire. The strength of Britain came from her yeomen, and he hoped that those who went on the land to-day would, like the yeomen of England, be ever ready to do national service for their country should the necessity arise.

Country Consciousness—An Appeal by the Premier.

AN earnest appeal to all parents who had boys available for work on the land to interest themselves in the opportunities offered by land pursuits was made by the Premier, Hon. W. Forgan Smith, at the Diploma Day ceremony. Mr. Forgan Smith, whose own son is a student at the Agricultural College preparing for a country career, said it was their duty and privilege to enter manfully into the possession of their great agricultural inheritance. It was their duty to cultivate the land and develop the State, and to do that they must get the aid of all intelligent people. Queensland for all time must be an agricultural country, and her future depended on the use they made of their opportunity. In the last analysis the only title to hold land was to put it to the best use. History showed that if they did not adequately develop it they might be compelled to make way for other people who would make better use of the land. The difficulties that beset the world were not outside the scope of man's own control. They could not in Australia complain that they lacked the essentials for building a great civilisation. It was up to them to use their collective intelligence so that the resources of Nature should be made available to all industrious people. In that direction people must become more "land-minded" than at present. He viewed with very grave misgiving the fact that while a number of youths were unemployed in all the great cities and work was available for them on farms it was difficult to fill those positions. Life on the land could be made attractive.

Put Boys on the Land.

MR. FORGAN SMITH added that the most impressionable period in life was between the ages of fourteen and twenty-one. During that period the habit of application to honest industry must be obtained. If a boy or girl did not get that training in industry or in habits, then he feared that their future would be poor indeed. It was their duty to develop Queensland's inheritance in land that they might be deemed worthy descendants of the country's pioneers. To do that they must settle this land with our own people and with our own boys. The problem of boys in industry was associated with the question of employment generally. It had been suggested that conditions were such that employers were not permitted to engage as many boys as they might like. But in skilled industries very few employers had as many apprentices as the law allowed. That was a serious position from a State point of view. Boys should be given the opportunity of learning trades for their own sakes and the sake of the nation. When normal times arrived there must be boys properly equipped for those trades. It was necessary that the minds of boys and girls should be turned to land, and land occupations, and that the intelligent co-operation of all interested in obtaining employment for the large number of boys and girls leaving school every year should be received. Everything the Government could do towards encouraging more employment of youth would be done, and he hinted that more would be announced on that subject shortly.

The Minister's New Year Message.

To the

FARMERS OF QUEENSLAND

SLOWLY but surely the world is emerging from the clouds of depression and is thinking of the more prosperous days ahead, but clear thinking and good leadership are essential if these hopes are to materialise.

Good leadership for those engaged in primary production was never more essential than to-day, for the problems arising from economic nationalism have already exercised a disturbing influence in our overseas trade in primary products. What then is the solution? The answer is not difficult and may be expressed in one word—co-operation. This implies the fullest and closest understanding of the nature of problems, and the intelligent application of this knowledge. We may take heart, however, that so far we have been able to resist restriction of production with all its evils, and have presented a unanimous opinion against such proposals. I earnestly hope that this attitude will be maintained during the difficult months ahead. The formation of a Federal Economic Agricultural Council will become the mouthpiece for the hopes, desires, and aspirations of our farming community, and the future is therefore fortified by the fact that at last Australia will speak with one agricultural voice.

I thank you all for help given to the Department during the past and, on behalf of the Department, wish you all a Happy and Prosperous New Year.

Frank. W. Bulcock

Codling Moth Control by Non-arsenical Sprays.

By HUBERT JARVIS, Entomologist.

DURING the last few years the use of arsenic in any form for the control of insect pests affecting fruits or vegetables intended for human consumption has become increasingly unpopular. Accordingly, with a view to finding a satisfactory substitute for arsenate of lead for the control of codling moth, experiments were carried out in the Stanthorpe district in the 1932-33 season with certain non-arsenical sprays. Interesting results were obtained which indicated the possibility that the use of arsenate of lead was not necessary in controlling this pest and, in order to confirm or invalidate these results, the experiment was repeated with certain additions and modifications during the 1933-34 season. The information obtained in this additional experiment is detailed in this report, the results of the earlier experiment having been published in the July (1933) issue of this Journal.

The Experimental Plot.

The orchard chosen for the experiment was situated in the Summit section of the district, and was separated from surrounding orchards by fairly large areas of scrub land, thus being more or less isolated. The codling moth infestation in the orchard during the previous few years had been fairly heavy, and it was thus considered very suitable for the work in view. It was realised that a late-maturing variety would give the fairest possible test for codling moth control, and accordingly the variety Granny Smith was chosen, because the apples would remain on the trees throughout the season until about the end of March. The plot comprised seven rows of trees, there being four trees to each row. The trees were all small, and the crop light, some trees carrying only two cases of fruit.

Materials Used and Mode of Application.

The treatment of the trees in the plot was as follows:—

Row No. 1—Trees 1 and 2 controls untreated; trees 3 and 4 barium fluosilicate.

Row No. 2—Trees 1-4 nicotine sulphate-white oil, but trees 3 and 4 given a calyx spray of arsenate of lead instead of the other insecticide.

Row No. 3—Trees 1-4 katakilla-white oil, with calyx spray as above.

Row No. 4—Trees 1-4 white oil 1-64 with calyx spray as above.

Row No. 5—Trees 1-4 white oil 1-100, with calyx spray as above.

Row No. 6—Trees 1 and 2, arsenate of lead; trees 3 and 4, controls untreated.

Row No. 7—Trees 1 and 2, potash soap; trees 3 and 4, katakilla.

In the case of the trees in Rows 2, 3, 4, and 5, however, the final spray applied on 15th February was white oil at 1-80 strength.

Barium fluosilicate was used at a strength of 1 lb. to 40 gallons; nicotine sulphate-white oil at the strength nicotine sulphate 1-640 and white oil 1-80. Katakilla-white oil was used at a strength of katakilla 2 lb. to 32 gallons, with white oil 1-80. White oil alone was used at 1-64 and 1-100 strengths. The arsenate of lead strength was 1 lb. to 40 gallons, except in the case of the calyx spray, which was double that strength, and the potash soap was used at a strength of 2 lb. to 32 gallons, katakilla also being used at 2 lb. to 32 gallons.

Five treatments were given in each case, and the spray was applied with a knapsack spray outfit fitted with a special spraying nozzle, enabling a very fine mist-like spray to be obtained. Approximately half a gallon of spray was used for each tree at each application, and each tree received a very thorough covering. All sprays were applied during sunny weather, and rain occurred very soon after the first four treatments. The cost figures are based on the local prices of the materials used.

Weather Conditions.

The rainfall, as will be seen from Table I., was heavy, being the most abundant for many years, and conditions were exceptionally favourable for the growth of the trees, although the excessive flow of sap may have been a factor contributing to the abnormal shedding of fruit, which occurred in the experimental orchard and generally in the district in the very early stages of development.

TABLE I.

STANTHORPE RAINFALL, 1933-34.

October, 1933	318 points
November, 1933	541 points
December, 1933	514 points
January, 1934	406 points
February, 1934	260 points

Seasonal Incidence of Codling Moth in the Stanthorpe District.

The codling moth was more troublesome in most orchards than was the case during the previous season, and many growers lost fairly heavily owing to this pest. This increase of moth was in great measure due to the wet conditions experienced preventing the application of sprays with a power spray at critical times, owing to the boggy nature of the orchards.

TABLE II.

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity of Insecticide in Ounces.	Quantity of Spray Fluid in Gallons.	Cost per Application.	Total Cost.
					s. d.	*s. d.*
1933.						
25th October..	2	Barium fluosilicate 1 lb. to 40 gallons	½	1	Not available	
16th November	2		½	1		
20th December	2		½	1		
1934.						
18th January	2		½	1		
15th February	2		½	1		

TABLE II.—*continued.*

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity of Insecticide in Ounces.	Quantity of Spray Fluid in Gallons.	Cost per Application.	Total Cost.
					s. d.	*s. d.*
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	
25th October	2			1	0 2½	
16th November	4	Nicotine sulphate 1·640, White oil 1·80	Nicotine sulphate ½ oz., White oil 4 oz. Each application to the four trees	2	0 5	
20th December	4			2	0 5	1 8½
1934.						
18th January	4			2	0 5	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	
25th October	2			1	0 2½	
16th November	4	Katakilla 2 lb. to 32 gallons, White oil 1·80	Katakilla 2 oz., White oil 4 oz. Each application to the four trees	2	0 5½	
20th December	4			2	0 5½	1 10
1934.						
18th January	4			2	0 5½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	
25th October	2			1	0 1¼	
16th November	4		White oil 5 oz. Each application to the four trees	2	0 2½	
20th December	4	White oil 1·64		2	0 2½	0 11¾
1934.						
18th January	4			2	0 2½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	
25th October	2			1	0 0¾	
16th November	4		White oil 3 oz. Each application to the four trees	2	0 1½	
20th December	4	White oil 1·100		2	0 1½	0 8¼
1934.						
18th January	4			2	0 1½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2		1	1	0 1	
16th November	2	Arsenate of lead.	0½	1	0 0½	
20th December	2	Calyx spray 2 lb. to 40 gallons.	0½	1	0 0½	0 3
1934.		Cover sprays 1 lb.				
18th January	2	to 40 gallons	0½	1	0 0½	
15th February	2		0½	1	0 0½	
1933.						
25th October	2		1	1	0 1	
16th November	2		1	1	0 1	
20th December	2	Potash soap 2 lb. to 32 gallons	1	1	0 1	0 5
1934.						
18th January	2		1	1	0 1	
15th February	2		1	1	0 1	
1933.						
25th October	2		1	1	0 2	
16th November	2		1	1	0 2	
20th December	2	Katakilla 2 lb. to 32 gallons	1	1	0 2	0 10
1934.						
18th January	2		1	1	0 2	
15th February	2		1	1	0 2	

Results Obtained.

On the data secured during the seasons 1932-33 and 1933-34, it is evident that arsenate of lead is not necessarily the most effective insecticide for the control of codling moth, and indeed the nicotine sulphate-white oil combination during both seasons gave a higher percentage of control than arsenate of lead. The katakilla-white oil spray, although fairly satisfactory as regards codling control, caused very considerable loss through scorching of fruit and foliage. Katakilla alone was quite unsatisfactory. White oil at 1-64 and 1-100 strengths was disappointing in this experiment. Potash soap gave decidedly interesting results, and further work with this spray seems justified, as it was the second cheapest non-arsenical spray used, and gave 80 per cent. sound fruit.

The efficiency of the nicotine sulphate-white oil combination renders it a very promising substitute for arsenical sprays, in spite of the fact that it is more expensive. There is, moreover, a considerable amount of experimental evidence that the nicotine sulphate-white oil combination as used in this experiment has a definite value as a fruit-fly repellant, and thus its value is very greatly enhanced. Some consideration has, however, to be given to possible cumulative ill effects of repeated applications of oil sprays, this being a point on which it is hoped to obtain evidence in the near future.

The figures showing the value or otherwise of the substitution of an arsenate of lead calyx spray for the other insecticide were certainly interesting, for although in three instances a slightly higher percentage of sound fruit was obtained where an arsenate of lead calyx spray was substituted, the difference is not nearly so great as was expected. It is, of course, almost universally believed that the calyx treatment with a double strength arsenical spray is of paramount importance.

TABLE III.

CODLING MOTH INFESTATION AT TIME OF PICKING.

Treatment.	Total Number of Apples.	Sound.	Per Cent.	Unsound.	Per Cent.	Codling infested.	Windfalls.
Barium fluosilicate	400	222	55·5	178	44·5	178	39
Nicotine Sulphate-White Oil	532	500	93·9	32	6·1	32	25
Katakilla–White Oil	292	225	77·1	67	22·9	67	31
White Oil 1·64 ..	537	375	69·8	162	30·2	162	35
White Oil, 1·100 ..	359	250	69·7	109	30·3	109	43
Arsenate of Lead..	266	225	84·6	41	15·4	41	23
Potash Soap ..	250	201	80·4	49	19·6	49	19
Katakilla	434	225	51·8	209	48·2	209	54
Controls	1,077	275	25·6	802	74·4	802	106

Acknowledgments.

Thanks are due to Major Letters, of the Summit, who very kindly made available his orchard for the work, and who rendered much assistance during the progress of the experiment. Thanks are also due to the Chief Entomologist, Mr. Robert Veitch, for his valuable co-operation and advice.

Pineapple Wilt Disease and its Control.

By H. K. LEWCOCK, M.Sc., B.Sc.Agr., Assistant Plant Pathologist.

NO other problem of pineapple culture has proved more difficult of solution than the prevention of wilt. Pineapple wilt is not a specific disease; as generally used the term refers to a type of plant failure which may arise from a variety of causes. Since the actual cause of wilting in pineapples is not always readily apparent, a certain amount of confusion exists amongst growers concerning the various types of wilt, their identification and their relative importance one to another.

PINEAPPLE WILTS OCCURRING IN QUEENSLAND.

In Queensland, the term "wilt" is commonly applied to failure of pineapple plants resulting from the attacks of three separate and distinct root-destroying organisms, any two or all three of which may occur together in one plantation. These root parasites are: (1) Nematodes (*Heterodera marionii*), (2) White grubs (*Lepidiota spp.*), and (3) Pathogenic fungi (*Phytophthora cinnamonii* et al.). In Hawaii, the pineapple mealy bug (*Pseudococcus brevipes*) has been found to induce still another type of wilt which, fortunately, is not yet known to occur in Queensland.

On imperfectly drained soils, pineapple wilt may develop without the agency of any parasitic organism, due to asphyxiation or drowning of the roots. This form of wilt, which is most likely to occur in wet seasons, is usually confined to small patches located in hollows or at the foot of slopes. However, owing to the sub-normal vitality of pineapples grown on poorly drained or compact soils, they are especially susceptible to the parasitic types of wilt, even in seasons of average rainfall.

Of the types of pineapple wilt known to occur in Queensland at the present time, by far the most important is that resulting from attacks of root-destroying fungi. Although nematodes and white grubs may cause acute wilt in certain types of soil under favourable conditions, the area affected is usually limited in extent, and does not enlarge very rapidly.

Nematode wilt in pineapples usually occurs on land which has previously carried a nematode-susceptible crop, such as tomatoes, or in plantations where it is the practice to grow this and similar small crops between the rows of pineapples. Wilt resulting from white grub injury is infrequently met with, and has been observed to occur only on red volcanic soils. In any case, the aggregate losses from nematode and white grub wilts are small in comparison with those caused by fungus root rots. To distinguish the lastnamed type of wilt from the others mentioned it has been named the wilt disease. This wilt disease is, unfortunately, all too prevalent in Queensland at the present time, and during the past few years it has caused extensive losses in nearly every district.

DESCRIPTION OF WILT DISEASE.

Wilt disease develops chiefly throughout the spring and early summer months, and is most prevalent during years of excessive rainfall. Plants one to two years old are most subject to attack, which invariably results in cessation of growth, both of suckers and parent plant.

PLATE 1.

Pineapple wilt disease in a young plantation at Woombye. Note the contrast between the collapsed foliage of the diseased plants in the foreground and the erect growth of the healthy plants at the rear.

In the initial stages of the disease the leaves of affected plants lose their normal dark-green colour and assume a drab oblivaceous hue. At first limp and flabby, they quickly droop and fall to the ground. This collapse of the foliage is the most striking symptom of wilt disease (Plate 1). After the plant has collapsed the leaves wither, commencing at the tips, but the final stages of the disease are slow, and complete shrivelling of the foliage may be delayed for months or even years.

When a plant becomes affected with wilt disease while its fruit is still immature, the subsequent development of the fruit is arrested, and it colours prematurely. This premature colouring of immature fruit on

Plate 2.

Two-year-old pineapple plant affected with wilt disease. Note the erect fruit stalk and the absence of sucker growths.

wilt-affected plants is preceded by a pronounced withering of the fruit stalk for several inches immediately below the base of the fruit. Despite the drying-out of the fruit stalk, however, its rigidity is usually such as to maintain the fruit in an upright position (Plate 2). Detachment of a fruit from a withered fruit stalk is a matter of comparative difficulty, a twisting movement being required to dislodge it. Prematurely coloured fruits from wilt-affected plants are spongy in texture and sub-acid to the

palate; consequently, they have no commercial value even when of marketable size, which is rarely the case.

Rotting of the roots is invariably associated with the foliage symptoms of wilt; in fact, decay of the roots may be well advanced before any foliage symptoms become apparent. Affected plants are usually so lacking in roots that they may be pulled from the ground with little effort.

The root-rotting fungi which cause wilt disease in pineapples are active chiefly during the winter and early spring months. The relatively low temperatures prevailing at this time of the year considerably reduce the rate of transpiration from leaves and fruit, and plants denuded of soil roots are able to maintain the rigidity of their foliage by absorption, through aerial roots, of the dew or rain water which collects in their leaf axils. The trough-like structure of turgid pineapple leaves makes them peculiarly adapted for collecting water in this way. However, with the advent of warmer seasonal conditions and the consequent acceleration of the transpiration rate, the water absorbed through the axillary or aerial roots is insufficient to meet the needs of the plant, and, in the absence of a subterranean root system, growth ceases, and a sudden collapse or "wilting" of the foliage takes place. This collapse of the leaves, which is the most striking symptom of wilt disease, is irreversible, as the aerial roots are unable to obtain sufficient nourishment for them to reach the soil and thus supply the water necessary to restore the foliage to a turgid condition. However, as some growers have observed, if wilt-affected plants are uprooted, their basal leaves stripped off, and the butt trimmed back to the embryo roots higher up the stem, they may be induced to make fresh growth on replanting. This practice is inadvisable, owing to the danger of further spreading the disease.

INCIDENCE AND DISTRIBUTION OF WILT DISEASE.

Outbreaks of wilt disease in pineapples are usually spasmodic in their occurrence, but when an outbreak does occur it may spread over a wide area with great rapidity. Until a few years ago only the soils of the older districts were infected with the fungous root parasites which cause wilt diseases, but the movement of planting material originating from wilt-affected plantations has greatly aided the dissemination of these organisms to the soils of the newer pineapple districts. At the present time the disease is known to occur in every pineapple producing district in Southern Queensland. New land, when first brought under cultivation, is usually free from pineapple wilt fungi, but it quickly becomes infected through soil carried on boots and implements, and through the planting of suckers, slips, or tops, contaminated with soil from diseased fields.

When a soil favourable to the development of pineapple wilt first becomes infected with root-rotting fungi, definite steps in the progress of the disease may be seen. On new land wilt first appears in roughly circular spots a few feet to several yards in diameter. Wilting is most advanced in the centres of these spots, while around their boundaries plants may be found showing only the very first symptoms of the disease. The plants just outside the wilt-affected spots appear healthy in every respect, although their roots are often already infected with fungi. The rate at which enlargement of the diseased areas takes place depends on a variety of conditions. The root-destroying fungi which

cause wilt disease in pineapples normally lead a saprophytic or scavenging existence in the soil, their capacity to act as parasites depending on the occurrence of certain conditions unfavourable to the pineapple plant itself. Any condition or circumstance which adversely affects the growth of the pineapple plant impairs its vitality, and thereby increases its susceptibility to attack from root-rotting organisms. Thus the vitality of the pineapple plant is a measure of its resistance to wilt disease.

SOIL CONDITIONS CONTRIBUTING TO THE OCCURRENCE OF WILT DISEASE.

The various factors which adversely affect the growth of pineapples and thus determine the development of wilt disease are not yet fully understood, but it is clear that the most important of these factors are soil and weather conditions. These factors are themselves inter-related. Because of its epiphytic or air-dwelling relationships and its limited root range, the pineapple plant is particularly sensitive to soil conditions, and the occurrence of wilt disease is almost always indicative of some deficiency in or unsuitability of the soil.

Soil Moisture.

One of the most important factors involved in producing soil conditions favourable for the development of wilt disease in pineapples in Queensland is the incidence and amount of rainfall. The heaviest losses from the disease occur during excessively wet seasons, as the subsoil formation of much of the coastal pineapple land has a relatively low permeability to water, due to accumulation therein of the leachings from the upper layers. Following periods of heavy rainfall the soil of such land may remain in a sodden, semi-waterlogged state a few inches below the surface for weeks or even months, thus providing conditions favourable for the development of wilt disease, as the pineapple plant is notoriously intolerant of any interference with free root transpiration.

Erosion or Wash.

Heavy downpours are not only harmful because of the excessively wet soil conditions which they induce, but also because of the incalculable damage which they cause through erosion or wash, especially in hilly country. Loose cultivated soil is much more readily dislodged by flood waters than that which is untilled or compacted and, consequently, erosion is often particularly acute in young fields during the wet months immediately following planting. Surface erosion also results in the loss of large quantities of organic matter, as the bulk of this soil constituent is contained in the surface layers.

In addition to soil impoverishment resulting from loss of plant foods, erosion also has a direct and immediate weakening effect on pineapple plants, due to the reduced root activity consequent on the removal of soil from around the root hairs concentrated close to the surface.

Organic Matter.

Pineapples cannot be grown successfully in soils lacking in organic matter. Furthermore, it has been found that the occurrence of wilt disease in pineapples is closely correlated with the amount of decaying vegetable matter in the soil. Deficiency or lack of this constituent results

in a weakened, short-lived, and wilt-susceptible type of growth, even when the mineral plant foods are supplied in abundance. Soils containing less than 3 per cent. of organic matter are generally unsuitable for pineapple culture.

The effect of organic matter on a soil is threefold—viz.: (1) physical, (2) biological, and (3) nutritional. In the early stages of its decomposition, however, the effect is predominantly a physical or mechanical one, and it is this effect which is of especial significance in pineapple soils. The stalks and fibrous materials hold the soil particles apart, thus preventing the formation of clods and hardpan, the water-holding capacity of the soil is improved, and drainage and soil aeration are facilitated. A high organic matter content provides moisture conditions favourable for pineapple root growth in the top soil layers where there is maximum aeration and drainage, and where excessively damp conditions conducive to wilt disease rarely obtain, even during abnormally wet seasons. Unfortunately, the soils of most of the pineapple districts in this State are deficient in organic matter, even when first brought under cultivation, and unless some provision is made for its replenishment this shortage becomes acute in a very short space of time. Failure to obtain profitable returns from old land when replanted with pineapples, or failure to prevent the spread of wilt disease in replanted areas, is frequently directly related to a deficiency of organic matter in the surface soil.

Soil Reaction.

Another important contributing factor to wilt development in pineapples is unsuitable soil reaction. Contrary to the views generally held by growers, pineapples thrive best in an acid soil, for the following reasons:—Firstly, because such conditions stimulate root growth; secondly, because acid soil conditions are usually associated with good drainage; and thirdly, because an acid soil solution has the capacity to supply both phosphorous and iron in concentrations adequate for the needs of this crop. Expressed in chemical terminology, the optimum soil reaction for pineapple growth, productiveness, and longevity has been found to lie between pH 4·5 and pH 5·0. The significance of soil reaction in determining the incidence of pineapple wilt disease is indicated by the fact that the disease has not yet been found to occur in Queensland on any soil of greater acidity than pH 5·1. Unfortunately, the acidity of most of the soils used for pineapple culture in this State is considerably lower than is desirable.

Liming of pineapple soils, by neutralising the slightly acid conditions which generally obtain in them, has also contributed to losses from pineapple wilt disease in Queensland. Once a fairly general practice, liming was carried out in the erroneous belief that acid soil conditions were harmful to pineapples. However, there is no record of any permanent benefit having accrued from the use of lime on pineapple soils in this State. This is possibly because the applications have generally been excessively heavy; light dressings of lime may occasionally be necessary on soils deficient in exchangeable bases, but such applications should be made with caution, and then only under technical direction.

PREVENTION OF WILT DISEASE.

The complete recovery of wilt-affected pineapple plants never occurs; in dealing with this disease prevention should be aimed at rather

than cure. The measures advocated for preventing wilt disease are largely directed at correcting the soil conditions which make its development possible. Incidentally, these preventive measures lead to more robust growth and increased yields.

Control of Soil Reaction.

Soils sufficiently acid to meet the requirements of pineapples occur only in a few localities in Southern Queensland, and then only over limited areas of country. Consequently, in most pineapple districts some increase in soil acidity is desirable.

Under field conditions the maintenance of the soil reaction at a definite point in the pH scale is not practicable, nor is it necessary. All that is required is for the soil reaction to be kept at or below the apparent "critical point" for wilt development—namely, pH 5·0—which also approximates to the optimum reaction for pineapple growth. This may be effected by the continued use of farmyard manures or other organic refuse, by repeated dressings of acidifying fertilizers such as sulphate of ammonia, or, more quickly, by a single application of *powdered* sulphur.

The rate at which sulphur should be applied to a pineapple soil in order to bring about a desired increase in acidity varies with the initial reaction of the soil, its texture, and its chemical composition. Other factors involved are the lack of uniformity in soil conditions throughout a field, and seasonal fluctuations in soil reaction. It has been found, however, that the action of the organism which oxidises sulphur to sulphuric acid in Queensland soils is arrested by a soil reaction of approximately pH 4·5, so that there is little or no danger of pineapple soils becoming too acid through the use of sulphur, even when it is applied in excessive quantities.

Throughout the coastal districts, where correction of soil reaction is most needed, an application at the rate of 600 to 700 lb. per acre should prove adequate in most cases. Once it is applied to soil, the oxidation of sulphur to sulphuric acid takes place with great rapidity, and ceases only when the supply of free sulphur is exhausted or when the concentration of acid reaches approximately pH 4·5. Any free sulphur which remains in the soil after this limiting acid concentration has been attained is not lost or destroyed, but is utilised gradually in maintaining the soil reaction at maximum acidity.

Sulphur should not be drilled into the ground or turned under by ploughing; it should be broadcast evenly over the surface just before planting, and then thoroughly scarified into the soil to a depth of 4 or 5 inches. On sloping land the rate at which sulphur is applied at the higher levels should be somewhat heavier than at the bottom of the slope. Sulphuring should be carried out during calm weather, preferably in the early morning. As previously pointed out, liming of pineapple soils—which has an opposite effect to sulphuring—is rarely advisable.

It should be clearly understood that, as far as the wilt disease is concerned, correction of the reaction of pineapple soils by the use of sulphur is purely a preventive treatment, and is likely to prove of benefit only when carried out prior to planting. Recent field experiments have shown, however, that the control of soil acidity is ineffective on land which has a low level of fertility, particularly with regard to its organic matter content.

Maintenance of Organic Matter.

This soil constituent should be conserved in every possible direction, since oxidation and consequent loss of organic matter proceeds with extreme rapidity in cultivated soils during the summer months, especially in the light sandy soils typical of the coastal districts. For this reason, summer cultivation of pineapple fields should be restricted to the shallow chipping necessary to destroy weed growth. On strong volcanic soils it is better to keep summer weed growth in check by cutting it down periodically rather than by cultivation, particularly on hillside plantations which are subject to wash. However, conservation of soil organic matter in itself is not enough. A soil well supplied with organic matter at the commencement of the cropping cycle may be seriously depleted in this ingredient after a few seasons, unless early provision is made for its replenishment. Horse, cow, or sheep manure is of inestimable value for this purpose, but its general use is precluded by the difficulty of obtaining supplies. In the Brisbane area pineapple plantations receiving annual dressings of stable refuse have thrived for more than fifty years without replanting being rendered necessary by wilt disease or soil impoverishment. Mulches consisting of dry grass, cane trash, or other plant refuse—provided it is free from weed seeds—are also of great value in pineapple plantations, not only because they enrich the soil in organic matter but also because they smother weed growth, conserve soil moisture, and stimulate surface root development.

Another and more widely applicable method of maintaining and replenishing the organic matter content of a soil is green manuring. Prior to replanting old land with pineapples it should be green manured both in winter and summer for at least two consecutive years. For winter planting, a quick-growing cereal such as barley is suitable, either when sown alone or, for preference, when mixed with a twining legume such as Golden vetch. Any nematode-resistant legume is likely to prove useful for green manuring old pineapple land during the summer months; the recently-introduced *Crotalaria goreensis* is promising particularly well for this purpose. It is deep-rooting, non-trailing, nitrogen-fixing, drought and nematode-resisting, and makes a strong, dense, branching growth both before and after cutting. This plant also promises to be valuable for cover-cropping young pineapple fields during the first summer after planting. Though not generally recognised, this is frequently the critical period in the life of a pineapple plantation, since oxidation of organic matter takes place with great rapidity in the loose, exposed soil, which is also very subject to wash during monsoonal downpours. A suitable deep-rooting leguminous cover crop planted between the rows of young pineapples at this stage of their growth not only retards oxidation of organic matter by shading the soil, but it also protects the latter from erosion, improves its drainage, and enriches it in nitrogen.

Drainage Improvement.

Measures for improving the drainage of land which is obviously subject to water-logging will seldom prove economically practicable, and such soils should be avoided for pineapples.

The drainage of soils, which are unduly retentive of moisture in wet seasons, may usually be greatly improved by the judicious placement of open-cut drains throughout the plantation, particularly along the headlands. The repeated use of a deeply-rooting cover crop, such as the

recently-introduced *Crotalaria goreensis,* will also do much towards improving the drainage of the leached coastal soils.

The permeability of soils which are retentive of water may be increased by the use of sulphur or gypsum. In addition to lowering the water-table of a soil, gypsum fixes free ammonia and, like lime, it also exerts a beneficial effect on the physical condition of a soil. Unlike lime, however, gypsum has little or no effect on soil reaction.

Prevention of Erosion.

For preventing surface or sheet erosion on steeply sloping land, contour drains should be employed in addition to the measures advocated for maintaining the organic matter content of a soil—namely, a minimum of cultivation during the summer months, and the widest possible use of mulches and cover crops, particularly those possessing fibrous or semi-woody stems.

Additional Cultural Precautions.

The source of the planting material used has much to do with the occurrence of wilt disease on new land. Whether it is intended to plant suckers or slips, care should be taken to see that these are obtained only from wilt-free stock. It is courting disaster to use planting material of unknown origin. The planting of butts is usually an unsound practice also, as these are mostly obtained from worn-out plantations in which wilt has often been prevalent.

In pineapple fields propagated from suckers, planting too deeply is occasionally a factor contributing to wilt disease outbreaks, due to the fact that root development from deeply planted sets is retarded by inadequate soil aeration and a weak, wilt-susceptible type of growth results. In several respects slips are to be preferred to suckers as planting material, one of which is that their structure precludes the possibility of excessively deep planting, thus permitting root growth to take place close to the surface.

In young plantations losses from wilt disease may sometimes be prevented by periodical rogueing or pulling out of all weakly or stunted plants, without waiting for definite wilt symptoms to develop. However, rogueing is only likely to prove effective when practised consistently from a few months after planting.

GENERAL RECOMMENDATIONS.

From the foregoing discussion it will be evident that losses from wilt disease in pineapples can be largely prevented by suitable cultivation practices and, where necessary, corrective soil treatments.

Briefly, it is recommended that land intended for pineapples should be—(1) Naturally well drained, (2) protected from erosion, (3) plentifully supplied with organic matter, and (4) suitably acid in reaction. If all these conditions are not fulfilled in the site selected for the plantation, the deficiencies should be rectified before planting is proceeded with or the land rejected in favour of a more suitable area. In addition, extreme care should be exercised in the selection of planting material. Subsequent to planting, care should also be taken to insure that the young plants receive no check in growth, and that all weakly or diseased plants are removed immediately they are observed.

Parasites of the Dog and Cat.

By F. H. S. ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

OF these two animals the dog is especially important in so far as its animal parasites are concerned, for some of these may, in some way or other, affect man and his live stock to a serious and sometimes fatal degree. Some of the numerous tapeworms that in the adult stage infest the dog may occur in their larval form in man, or the sheep, pig, &c. Of these the hydatid tapeworm is by far the most important, for its larval stage may cause in man a very serious and frequently fatal disease. Measles in sheep and gid in sheep are the result of infestation with the bladderworms or larvæ of two other dog tapeworms. A very common dog tapeworm, the double-pored tapeworm, which is spread by the dog flea and dog louse, has occasionally been found in the intestine of man. A skin disease of man, called creeping eruption, and prevalent in parts of America, has been shown to be due to the larvæ of a species of dog hookworm, which, in the human host, wander about under the surface of the skin. Sarcoptic mange, which is a common skin disease of dogs, may also be transmitted to man, and although the tiny mites responsible for the condition do not succeed in establishing themselves on their human host, they may live long enough to cause serious irritation and annoyance. Finally, the annoyance caused by armies of fleas, both indoors and outdoors, may usually be directly traced to the presence of the dog.

Control of the parasites of the dog becomes therefore a matter of the greatest importance. The dog is probably the most domesticated animal associated with man; it shares his house, sometimes his plate, and even his bed, and from the point of view of public health may, if its parasites are not controlled, become a serious menace. It is, therefore, the duty of every dog owner to see that his animals are regularly treated for both external and internal parasites, and what is more important, to take all possible steps to prevent them from becoming infested.

EXTERNAL PARASITES.

A variety of external parasites infest the dog and cat, the most important of which are lice, mites, ticks, and fleas.

PLATE 3.—THE BITING LOUSE OF THE DOG (*Trichodectes canis*).
Enlarged (after Denny).
From Bulletin No. 5, New Series, U.S. Dept. Agric.

LICE.

Two species of lice are found on the dog, a biting louse, *Trichodectes canis* (Plate 3), and a sucking louse, *Linognathus setosus* (Plate 4).

The sucking louse is a small yellowish species which, by means of its piercing and sucking mouthparts, pierces the skin of the dog and sucks up blood and serum on which it lives. This louse has a long, slender, pointed head.

The biting louse is smaller than the sucking louse, with a comparatively broad and flat head. This louse lives on the scales, scurf, &c., to be found on the skin surface.

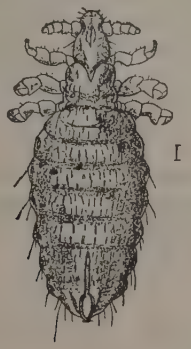


Plate 4.—The Sucking Louse of the Dog (*Linognathus setosus*).
From Bulletin No. 5, New Series, U.S. Dept. Agric.

Louse infestation may produce serious irritation, causing the animal to bite and scratch the infested portions of the body sometimes resulting in the formation of raw, tender areas. Puppies are especially susceptible to infestation, and cases are known in which the lice have been numerous enough to cause the death of these young animals. The biting louse is also an intermediate host of the double-pored dog tapeworm, which has on occasions been found in the small intestine of children.

Cats may be infested with a small species of biting louse, *Felicola subrostrata,* which, however, does not appear to be of much importance.

Treatment and Control.

Dogs infested with lice may be cleaned by a thorough washing in a phenolic dip.

Good results also follow the use of either derris or pyrethrum powder, which is dusted thoroughly into the coat of the animal. The powder should be allowed to remain on the dog or cat for about half an hour. It may then be combed or brushed out on to a newspaper, the paper with the dead and stupified lice thus obtained then being burnt.

In the case of cats, of course, only dusting is practicable.

The treatment should be repeated every eight to ten days till no more lice are seen.

MITES.

Mite infestation causes mange, a diseased condition of the skin which causes great irritation and makes the animal very weak and very susceptible to other parasites and other diseases. Great care should be exercised in treating a dog affected with mange for worms, as the animal may not tolerate the same dosage of the drug used as a healthy animal.

Dogs may suffer from three distinct types of mange, namely sarcoptic mange, demodectic mange, and auricular mange. Cats may also be affected by auricular mange and by a type of sarcoptic mange.

Sarcoptic Mange of the Dog.

This form of mange is caused by a minute mite, *Sarcoptes scabiei canis*, which is only one-fiftieth of an inch in size. This mite lives in galleries under the skin, the burrowing of the mites through the skin irritating the tissues and causing the formation of small red spots. In time papules appear from which serum exudes. The drying serum forms yellowish crusts which mat the hairs together. Ultimately the hair may fall out and bare scabby patches of skin are seen. The great irritation caused by the infestation results in the animal biting and scratching itself, thus forming large raw areas which may become invaded by bacteria. With the disease a distinctly mousy odour is associated. Sarcoptic mange usually commences on the head, elbows, and chest wall and on the hind legs in the region of the hocks and stifle. In advanced cases, the whole of the body may become affected, the health of the animal is greatly impaired, and unless treated the animal may die.

Occasionally, and especially in young animals, this disease takes the form of dry, bran-like scales matting the hair together. This type does not appear to cause any great irritation.

Treatment and Control.

The affected animal should be first clipped and washed thoroughly with green soap to remove all dirt, crusts, and scales. When this has been done wash the dog in a 1 per cent. solution of potassium sulphurata. Then apply—

1. Liquor picis carbonis	10 parts
Sublimed sulphur	10 parts
Potassium carbonate	2 parts
Cottonseed oil	120 parts

or ..

2. A solution of lime sulphur.

For localised mange 4 per cent. salicylic acid will give good results. "Odylen," to be applied as directed by the proprietors, is also a satisfactory treatment for mange.

When the infestation is extensive it is safest when using formula 1 to treat only one-quarter or one-third of the body at the one time. A complete cure might require several applications. In addition the animal should be muzzled to prevent him licking the treated portion of the body, and during the period of treatment the bowels should be kept open with Glauber's salts.

It should also be borne in mind that everything that will build up the health of the dog and increase its resistance to the disease should be considered. Good nourishing food, including an adequate supply of meat, fresh air, and exercise are necessary. A good tonic may be given, and as such the following will be found satisfactory:—

Citrate of iron and ammonia	5 grains
Liquor arsenici hydrochloricus ..	3 minims
Tincture nux vomica	5 minims
Chloroform water to make	2 drachms

This represents a single dose which is given twice daily after meals.

Kennels, &c., used by dogs affected with mange should be thoroughly cleaned and disinfected. It should be remembered that sarcoptic mange of the dog is transmissible to man, so great care should be exercised when handling dogs affected with this disease.

Scarpotic Mange of Cats.

This type of cat mange is caused by a minute mite known as *Notoedres cati* and is restricted usually to the head and neck. The disease causes the hair to fall out and the skin becomes wrinkled and scurfy with scab and pustule formation. The infestation causes great irritation to the cat, the animal shaking its head and continually scratching and rubbing the affected areas.

Treatment and Control.

Clip the hair from the diseased parts of the body and rub in vaseline. The vaseline is then removed by the use of a dry cloth and bran after about an hour. Then apply—

Sublimed sulphur	2 parts
Potassium carbonate	1 part
Lard	8 parts

The treatment is repeated every four to six days till the animal is cured. Attention should also be given to the sleeping quarters, &c., of the animal, which must be kept thoroughly disinfected.

Demodectic Mange of the Dog.

Also known as follicular mange, this skin disease is caused by a minute worm-like mite, *Demodex canis,* one-hundredth of an inch in size, which infests the hair follicles. The disease usually appears first around the head, elbows, and hocks, and takes the form of hairless patches often reddish in colour. These patches may simply extend and appear as scurfy areas, but if invaded by bacteria pustules of various sizes are seen. These may run together and the skin thickens and is easily damaged. The poisonous substances resulting from the infestation with the mites and bacteria become absorbed into the body and cause serious disorders. The animal becomes emaciated and weak and may die.

Treatment and Control.

There is no highly efficacious treatment known for demodectic mange, but if the treatment for sarcoptic mange is carefully followed and persisted with, the disease may be held in check and may sometimes be completely cured.

Castor oil smeared over the affected portions of the body has been recommended in some quarters. Another treatment which has been used successfully consists of the use of Lassars paste (salicylic acid 2 parts, starch 24 parts, zinc oxide 24 parts, and vaseline 50 parts).

It is now generally considered that the mite itself does very little harm and that the disease is due mainly to the invasion of the skin by pus-forming bacteria. The use of an autogenous vaccine—that is, a vaccine made from cultures of the bacteria present in the dog to be treated—has been advised and good results claimed from its use. Violet rays and X-rays have also been used successfully.

The treatment of mange is really a matter that can be dealt with competently only by a qualified veterinary practitioner, and owners of dogs affected with mange should have no hesitation in placing their animals under such care.

Auricular Mange in Dogs and Cats.

This type of mange is seen principally on the dog and its occurrence on cats is regarded as being rare. The mite causing this disease is called *Otodectes cynotis* and is slightly larger than the sarcoptic mange mite. Auricular or ear mange is confined to the ears, the irritation produced by the mites interferes with the production and disposal of wax and as a result the ear becomes filled with wax and other waste matter produced by the irritated tissues. The infested animal shakes the head and rubs and scratches the ears, causing sores and bleeding. Nervous symptoms may be shown, the animal whining and howling and is sometimes seized with fits.

Treatment and Control.

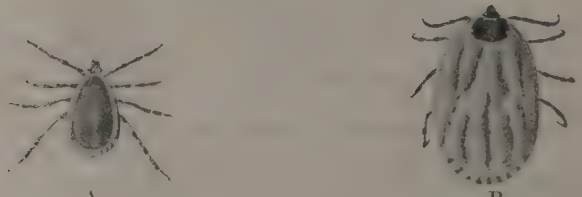
First remove all wax, &c., from the ear as carefully as possible with a pair of forceps, then swab the ear canal out with one of the following:—

1. One part of chloroform in nine parts of castor oil.
2. One part carbontetrachloride in three parts of castor oil.

Diagnosis of Mange in Dogs and Cats.

Dogs and cats may suffer from many skin diseases somewhat like mange in appearance, but in which parasitic mites are not concerned. As these particular diseases are treated by methods entirely different from those adopted for mange, it is essential that the cause of the condition be diagnosed before treatment is commenced. Mange can usually be determined only by the examination of skin scrapings, in which the mites can be seen under the microscope. These skin scrapings should be made from several parts of the affected area and the scrapings should be deep enough to cause the appearance of blood. They should then be placed in a tightly-corked bottle or sealed tin and forwarded to the laboratory.

THE DOG TICK (Rhipicephalus sanguineus).



A B

PLATE 5.—THE DOG TICK (*Rhipicephalus sanguineus* Latr.) (A) and (B).
A.—Male. B.—Female.

This is the common tick infesting the dog in Queensland and is found everywhere in the State, even in the dryest and hottest areas. The male is oval in shape and brown in colour and is to be seen crawling about among the hairs of the coat. (Plate 5 (A).) The unfed female is

greyish with dark-brown legs. (Plate 5 (B).) When engorged with blood the body colour changes to dark-red. The dog tick is an entirely distinct species from the common cattle tick, *Boophilus microplus,* which has pale fleshy legs.

Life History.

The female tick when fully fed drops from the dog, crawls away to some sheltered spot, and lays her eggs, of which up to 2,500 may be deposited. The eggs hatch in from nineteen to forty-one days, giving rise to tiny six-legged larvæ. The larvæ soon commence to look for a host, attaching themselves at the first opportunity and begin to feed. After from three to seven days the larva is engorged, drops off the dog, hides away, and after a period of rest, sheds its skin to become a four-legged nymph. In turn the nymph attaches itself to the dog, engorges in from four to ten days, drops off, moults, and the adult tick appears. Again, the adult tick waits for a host, attaches itself, and if a female becomes fertilized by the male, engorging in from six to fifty days. She then drops off, lays her eggs, shrivels up and dies.

Treatment and Control.

The fact that the dog tick is a three-host tick and that the larva and nymph can survive as long as eighty days and 150 days respectively in the absence of the dog make its control by no means an easy problem. Premises on which dogs have been for some time become so heavily infested that no sooner is the animal cleaned by hand-picking or dipping than he is shortly afterwards just as thickly infested. Control of this tick is therefore largely a matter of patient effort. Following a thorough dipping in a phenolic dip the animal should be carefully examined at least every three to four days, and all ticks removed by hand. Particular attention should be given inside the ears and between the toes. In addition, his kennel and bedding should be kept as clean as possible, the kennel being frequently sprayed with dip and the bedding boiled. Any other places frequented by the dog should be marked and sprayed.

THE SCRUB TICK (Ixodes holcyclus).

A B

Plate 6.—The Scrub Tick (*Ixodes holocyclus Neum*) (A) and (B).
A.—Male. B.—Female.

This tick is normally parasitic on marsupials and is found throughout the scrubs of the eastern portion of the State. The male tick is oval in shape and yellowish in colour. (Plate 6 (A).) The unfed female has a greyish body with yellow legs. (Plate 6 (B).) When fully engorged with blood this sex assumes a very conspicuous size, and becomes dark-reddish in colour.

Among its marsupial hosts the scrub tick causes little harm, but when it attacks man and the domesticated animals a serious condition of paralysis may result. Dogs are especially susceptible to tick paralysis, and in areas where the tick is numerous it is an exceedingly difficult matter, unless adequate steps are taken, to keep a dog alive for any length of time.

An affected animal shows first of all paralysis of the hind limbs, the condition gradually including the forelimbs, head, and neck. When the paralysis reaches this stage the animal rarely recovers.

Treatment and Control.

Various remedies have from time to time been recommended for the treatment of tick paralysis; of these trypan blue is most prominent. This drug is made up and used as follows:—

A 2 per cent. solution (about nine grains to a fluid ounce of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly-folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The solution is used. The hypodermic syringe and needle before being used should be placed in a dish containing water, then placed over the fire and boiled for ten minutes. This is now ready for use when the solution has cooled.

The injection can be made anywhere under the skin, but the best positions are either in front of the chest or behind the shoulder. A fold of skin is caught up with the fingers of the left hand and the needle manipulated with the right hand.

The dose for dogs varies according to age and size from 1 to 5 drachms.

On the other hand, Dr. I. Clunies Ross, who has made a very careful study of tick paralysis, considers that there is no drug which is of any value once paralysis has appeared, and in such case his recommendations are as follows:—

1. Remove all ticks from the sick animal. Kerosene or turpentine are useful for this purpose, a few drops being placed on the tick. It is probably best to use a pair of sharp scissors and snip off with the tick the small piece of skin to which it is attached.
2. Any fluids should be given slowly and in small quantities only. If the animal vomits, water and nourishment should be given per rectum.
3. The rectum and bladder should be frequently emptied by the use of enemas and catheters.

Very few animals make a complete recovery and for this reason preventive measures are very important. In ticky country, therefore, the dog should be carefully examined daily for ticks, paying particular attention to the head, neck, and forequarters.

FLEAS.

The flea usually found on the dog is a different species from that occurring on the cat. The dog flea is known as *Ctenocephalides canis*

(Plate 7) and the cat flea as *Ctenocephalides felis*. These two species are by no means restricted to their respective hosts; the cat flea may be found on the dog, and vice versa, and both are concerned with infestations of dwellings, stables, and other outhouses, causing considerable annoyance to man and his livestock.

Life History.

The eggs laid by the female flea on the dog or cat fall to the ground and in time hatch to give rise to a tiny maggot. The maggot feeds on the animal and vegetable matter in the dust, &c., in which it lives. When fully grown the maggot forms a sort of cocoon from the debris around it and inside this cocoon it pupates. From this pupa the adult flea eventually emerges.

Plate 7.—The Dog Flea (*Ctenocephalides canis*). Female. Lateral View. Enlarged. From Martini, 1923.

Control of Fleas on Dogs and Cats.

Dipping or the use of pyrethrum powder as directed for the control of lice will give good results. At the same time a tention should be paid to the kennel and other places frequented by he animals, and these should be kept as clean and as free of litter as p. ible.

Control of Fleas Indoors.

Very frequently dwellings become infested with fleas and to eradicate these the following recommendations are given:—

1. If electricity is available a vacuum cleaner will get rid of a large number.
2. Remove all furniture and spray well with petrol. Petrol is highly inflammable and great care should be given its use. The skirting boards and cracks in the floor should receive special attention.
3. Hang all rugs, carpets, &c., in the sun and beat well.
4. Treat all cats and dogs as directed.
5. If the infestation is exceedingly heavy it may be best to place the matter in the hands of a reliable firm of fumigators.

Control of Fleas Outdoors.

Stables, pigsties, and the ground beneath dwellings are frequently infested by armies of fleas, and to control these the following suggestions are given:—

1. Treat all dogs and cats as directed.
2. Clean up all litter and surface dust and burn.
3. Sprinkle the soil with coarse salt and keep damp for a period of about 14-21 days. In cases where there is any danger of stock consuming large quantities of the scattered salt it is best to omit this chemical and use water only. This will destroy the larvæ, &c., in the breeding grounds.
4. Spray floors of outbuildings and other spots where adult fleas are present with petrol.

INTERNAL PARASITES.

Many different kinds of internal parasites have been recorded from the dog and cat, all of which, with the exception of one form which is related to the mites, are helminths or worms. Puppies and kittens are most seriously affected by internal parasites and a high death rate among these young animals may follow infestation.

ROUNDWORMS.

THE LARGE ROUNDWORMS OF THE DOG.

Two distinct species of large roundworms are found in the small intestine of the dog—namely, *Toxocara canis* and *Toxascaris limbata*. The latter species is an elongate whitish worm growing up to about

PLATE 8.—THE LARGE ROUNDWORM OF THE DOG (*Toxocara canis*). Natural size.

4 inches in length. The female is the larger of the two sexes, the male attaining only a length of about 2½ inches. *Toxocara canis* (Plate 8) is yellowish and somewhat larger and stouter, female worms measuring as much as 7 inches in length.

Life History.

The life history of both these species of roundworms is practically the same. The eggs laid by the female worms in the intestine are voided with the fæces and under favourable conditions of temperature and moisture reach the infective stage in a few days, when the egg contains a very tiny worm. When these eggs reach the mouth of the dog and are swallowed, they hatch in the small intestine and the young worms are set free. These burrow into the wall of the intestine, and, reaching the blood vessels, are carried in the blood stream to the liver. The tiny worms then travel on to the lungs, where they remain for several days. When their development in the lungs is completed, the worms, still very minute in size, crawl into the windpipe, reach the mouth, and are swallowed. In this way they reach the small intestine again, where they settle down and grow to maturity.

Effect on the Dog.

Infestation by these large roundworms is most serious among puppies and young animals, and when the worms are numerous an emaciated and unthrifty condition may be present. The worms may cause blockages in the intestine, seriously interfering with digestion, and it is not uncommon for them to wander into the stomach and cause vomiting. The larvæ, when migrating through the liver and lungs, may be responsible for serious injury to these organs with consequent ill-health to the infested animal. In general the following symptoms may be indicative of roundworm infestation:—A dull, harsh, and erect coat, emaciation, stunted growth, nervous disorders, diarrhœa, and sometimes bloated abdomen. The worms are frequently passed in numbers in the fæces or they may be vomited.

Treatment and Control.

Oil of chenopodium is the most satisfactory drug for the removal of the large roundworms. Withhold food overnight and next morning give the drug in capsules at the rate of 1 cubic centimetre for a 22 lb. dog, immediately preceded by 1 fluid oz. of castor oil. Do not allow any food till the bowels have moved.

Oil of chenopodium is a highly poisonous drug and great care should be taken to see that the castor oil moves the bowels. If no purgation has occurred within four to five hours after treatment another dose of castor oil should be given.

For puppies the dose rate is diminished to 1 to 3 minims with 1 fluid oz. of castor oil. Oil of chenopodium should not be used for dogs suffering from severe mange, distemper, gastro-enteritis, or in other cases of great weakness.

Tetrachlorethylene (Nema capsules) is much safer than oil of chenopodium though not so efficient and is given at the rate of 2 cubic centimetres for a 22 lb. dog. If the infestation is heavy it is just as well to follow the drug with Epsom or Glauber's salts.

Santonin is the safest drug for puppies and delicate breeds, and if given in the morning three hours before feeding at the rate of ¼ to 1

grain with an equal amount of calomel for six or seven days good results will be secured.

In addition to treatment preventive measures should be adopted. These consist of—

1. The prompt removal of all fæces from kennels and yards.
2. Treat all wooden floors with a boiling disinfectant solution.
3. Remove the old contaminated dirt surfaces and replace with new, clean soil.
4. Keep older animals free of worms by regular treatment.
5. Keep young animals away from contaminated yards, &c., as much as possible.

THE CAT ROUNDWORM (Toxocara mystax).

PLATE 9.—THE LARGE ROUNDWORM OF THE CAT (*Toxocara mystax*). Natural size

This is the large roundworm of the cat and is found in the small intestine. The female worm may attain a length of about 4 inches; the male is smaller, measuring only 2½ inches. Its life history and harmful effects are very similar to those detailed for the large roundworms of the dog.

Treatment.

Withhold all food overnight and next morning give tetrachlorethylene in capsules at the rate of 1 cubic centimetre for an 11 lb. cat, followed by 1 fluid oz. of castor oil five hours later.

HOOKWORMS (Ancylostoma caninum).

Plate 10.—The Hookworm of the Dog and Cat (*Ancylostoma caninum*). Natural size.

In Queensland both dogs and cats may be infested with this species of hookworm. It is a comparatively small worm, $\frac{1}{3}$ to $\frac{1}{2}$ inch in length. The mouth is provided with six strong curved teeth which enable the parasite to grasp and feed on the wall of the intestine.

Life History.

The female worms in the small intestine lay numerous eggs which are voided in the fæces. In about 36 hours, under favourable conditions of temperature and moisture, these eggs hatch and tiny larval worms appear. The larva grows and develops in the fæces and eventually reaches a stage when it is completely enclosed in a sheath. It is now ready to infect the dog or cat and this may occur in either of two ways. The larva may be swallowed with food or water or it may bore its way into the body through the skin. In either case, the young worm reaches the blood stream and is carried to the lungs. From here it proceeds to the small intestine in much the same way as the larvæ of the large roundworms. Once in the small intestine it attaches itself to the wall of the intestine and grows to maturity.

Effect on Dogs and Cats.

The principal host of this hookworm is the dog, and so far as can be ascertained it usually occurs in the cat only in small numbers.

The worm is a notorious bloodsucker and a heavy infestation may cause a serious loss of blood. As a result the infested animal becomes anæmic, a condition which may be detected by examining the mucous membrane lining the mouth and eyes. In a healthy animal this is

pinkish to red, but if anæmia is present the membrane is bleached white. In addition the animal may show pot-belly and swellings under the jaw. Diarrhœa sometimes with blood-tinged fæces may be present. There is a distinct loss of condition, the coat is harsh and erect, the eye sunken, and the animal is dull and depressed.

Treatment and Control.

The tetrachlorethylene treatment as recommended for the large roundworms of cats and dogs respectively is also effective for hookworm in these animals.

Carbontetrachloride is a more efficient drug than tetrachlorethylene for the removal of hookworms from dogs though not so safe. The drug is given in capsule at the rate of 3 cubic centimetres for a 22 lb. dog. The treatment should include a purgative administered after the drug, Epsom salts or Glauber's salts being recommended.

All fats and oils should be excluded from the animal's diet for some days prior to treatment. The dog is starved overnight and the drug given next morning. If the bowels have not moved three hours after treatment, another dose of salts should be administered. No food should be given until proper purgation has been obtained. Tetrachlorethylene only should be used for puppies or animals in a weak condition.

Hookworm infestation can be prevented to a large extent if the preventive measures advised for the large roundworms are adopted.

THE WHIPWORM OF THE DOG (Trichuris vulpis).

This worm gets its common name from its resemblance to a whip. The species may grow up to 3 inches in length and is found in the cæcum or blind gut.

Dogs become infested when they swallow eggs which contain a tiny larval worm. These eggs hatch in the small intestine and the young worms become mature in the cæcum.

There is no simple and effective treatment yet known for whipworm infestation, but the use of santonin, as recommended for the large roundworms, is worth a trial.

The prompt removal of all dung, &c., is essential if whipworms are to be controlled.

THE HEARTWORM OF DOGS (Dirofilaria immitis).

This is a worm of conspicuous size which is found in the heart and pulmonary artery. The female may grow to about 12 inches in length, though the male rarely measures more than 5 or 6 inches. The species is very prevalent among dogs in North Queensland and is responsible for many deaths.

Life History.

The female worms in the heart or pulmonary artery deposit tiny active larvæ which escape into the blood stream. These larvæ are taken up by night-biting mosquitoes when they bite the dog and suck up blood. The larvæ undergo certain development in the mosquito, and when the insect bites a dog the larvæ are liberated into the blood stream of the animal and make their way to the heart or pulmonary artery, where they settle down and grow to the adult stage. There is a possibility that the dog flea and cat flea may also act as an intermediate host in much the same way as the mosquito.

Effect on the Dog.

Frequently no symptoms are shown till the dog is being exercised, when the animal may drop down as if dead to recover after a while. On other occasions such symptoms as abdominal dropsy, emaciation, difficult breathing, coughing, and convulsions are associated with heartworm infestation.

Plate 11.—The Heartworm of Dogs (*Dirofilaria immitis*). Natural size.

Treatment and Control.

Two drugs are available for the treatment of heartworm in dogs—namely, "Fouadin" and sodium-antimony-111-bis-pyrocatechin-disulphonate of sodium. The use of these is rather complicated and is best left to the qualified veterinary practitioner.

Prevention consists of attention to the control of the particular species of mosquito and fleas responsible for carrying the larvæ and any other measures which will prevent the dog being bitten.

TAPEWORMS.

TAPEWORMS OF THE DOG.

Several different species of tapeworms are found in the small intestine of the dog. These vary tremendously in size, one species being only ½ inch long while others attain a length of 15 feet or more. They are all armed tapeworms, that is, the head is provided with hooks which

enable the worm to grasp the wall of the intestine and maintain its position in this part of the alimentary tract. The segments containing the ripe eggs become detached from the body of the worm and are voided in the fæces of the dog. These eggs must then be swallowed by another animal, known as the intermediate host, before the life cycle of the tapeworm can be completed. Man, sheep, cattle, horses, pigs, rabbits, fleas, &c., may all play the part of intermediate host for the respective species, and in these animals the life cycle stage is known as a bladder worm, which is really a larval tapeworm. This is a cyst-like body filled with fluid. The dog then becomes infested, when it eats portions of these animals which contain these bladder worms.

The most important dog tapeworm is the hydatid tapeworm *Echinococcus granulosus*, which in the adult stage is only about ½ an inch long. Almost any mammal may act as an intermediate host for this tapeworm, including man and his livestock. In these animals, the bladder-worm stage is usually found in the liver or lungs, and in man, hydatids, or infestation with the bladder-worm, which may grow as big as a child's head, is a serious and frequently fatal disease.

The adult tapeworm is more prevalent in country dogs than in city dogs, due to the less strict supervision given the disposal of the organs containing the larval stage in the country and station slaughter-house.

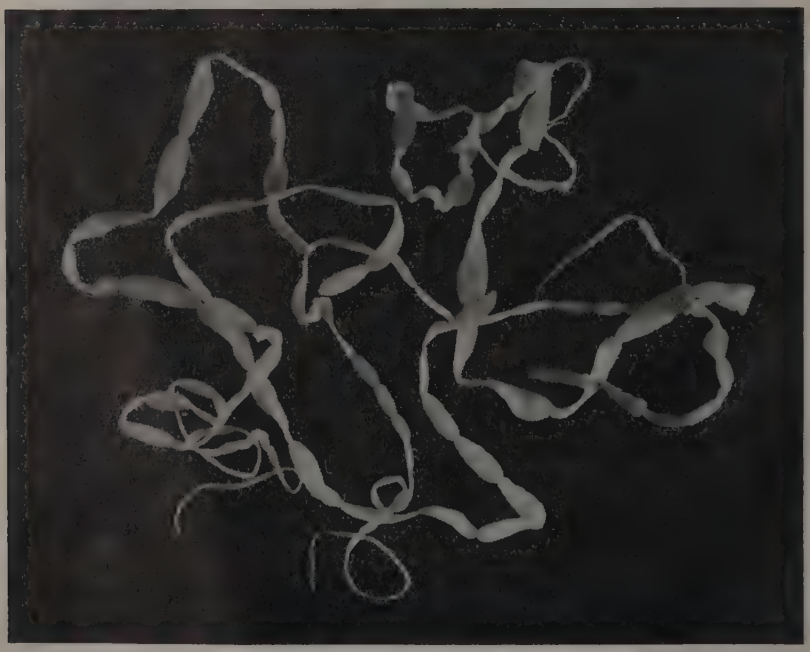


PLATE 12.—THE DOUBLE-PORED TAPEWORM OF THE DOG (*Dipylidium caninum*). Natural size.

All such offal should be thoroughly cooked before being fed to the dog, and so long as the dog receives raw liver, lungs, &c., hydatids will always be fairly prevalent in man.

The so-called "hydatids" in rabbits bears no relation to hydatids in man and is the larval stage of *Taenia pisiformis*, another dog tapeworm, the rabbit being the intermediate host of this species.

The most common tapeworm found in the dog is the double-pored tapeworm, *Dipylidium caninum* (Plate 12). This species is whitish or pinkish in colour and its segments are much longer than broad. The double-pored tapeworm may be spread by the dog flea, *Ctenocephalides canis*, or the biting louse *Trichodectes canis*. The flea becomes infected in the larval stage, the larvæ swallowing the eggs of the tapeworm present in the dust and dirt in which they live. The biting louse swallows the eggs on the contaminated skin of the dog. In the flea and louse the eggs develop into a bladder-worm and the dog becomes infested when it eats either of these insects. One of the principal measures in the control of this tapeworm is, therefore, keeping the dog free from fleas and lice.

Frequently in the body cavities of sheep, and sometimes cattle and pigs, one sees small bags of fluid suspended from the mesentery. This is the larval stage of another dog tapeworm, *Taenia hydatigena*.

Gid, which is a serious disease of sheep in Europe and America, and fortunately not present in Australia, is caused through the invasion of the brain of the sheep by the larvæ of the dog tapeworm, *Multiceps multiceps*. When the brain of an affected sheep is eaten by the dog, the larval forms develop into the adult tapeworm in the intestine of the dog.

Effect of Tapeworm Infestation on the Dog.

Heavy infestations are frequently conducive of nervous and digestive disturbances. Occasionally the worms may bunch together and form blockages in the intestine. There may be emaciation, and a very capricious appetite. Sometimes the voiding of the segments, especially those of the double-pored tapeworm, may cause itching of the anus, and to relieve this the dog may drag itself about on its haunches.

Treatment and Control.

Withhold all food overnight and next morning give arecoline hydrobromide in the following dosages:—

Small dogs	$\frac{1}{8}$ to $\frac{1}{4}$ grain
Medium dogs	$\frac{1}{4}$ to $\frac{1}{2}$ grain
Large dogs	$\frac{1}{2}$ to 1 grain

The drug is most conveniently given in a small quantity of water. Before treatment is attempted the stomach must be empty, otherwise the animal will vomit, and the efficiency of the treatment may be greatly reduced. Arecoline hydrobromide is very prompt in its action and the worms may be passed in twenty to thirty minutes after administration. No food should be given till three hours after treatment.

These dosages should be reduced for animals in a weak condition, and in such cases it would be safer to use kamala, freshly-ground areca nut, or oleoresin of male fern.

The preventive measures for the control of the dog tapeworms have already been discussed, but for the sake of emphasis are repeated:—

1. Keep the dog free of all fleas and lice.
2. Never feed raw offal to a dog; see that it is well cooked first.
3. When practicable all fæces should be removed promptly.

TAPEWORMS OF THE CAT.

Three species of tapeworms may be found in the intestine of the cat —namely, the cat tapeworm, *Taenia taeniaeformis;* the broad tapeworm, *Diphyllobothrium mansoni* (Plate 13) and occasionally the double-pored tapeworm of the dog *Dipylidium caninum.*

The cat tapeworm grows up to 2 feet in length. Its larval stage occurs in the livers of rats and mice, the cat becoming infested through eating these rodents.

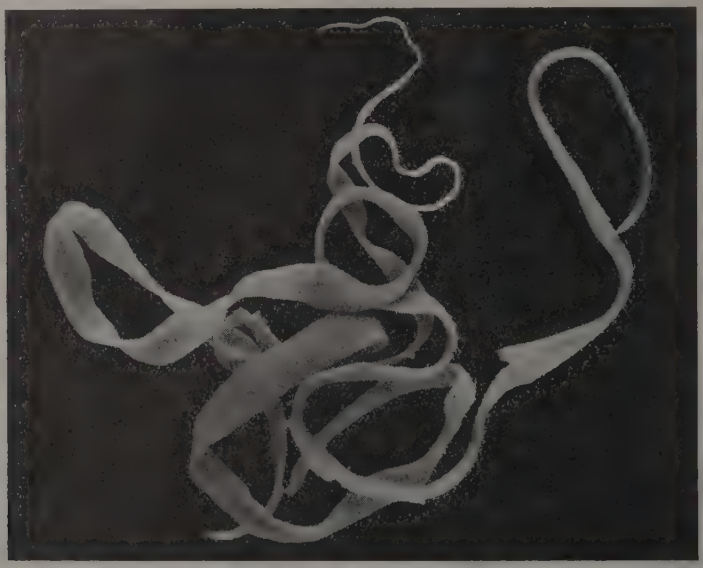


PLATE 13.—THE BROAD TAPEWORM OF THE CAT (*Diphyllobothrium mansoni*). Natural size.

The broad tapeworm (Plate 13) is a rather common species attaining a length of about 18 inches. It may be readily recognised by the series of spots in the middle of the segments. The life history of this species is unknown in Queensland, but it is thought that frogs may possibly fill the roll of intermediate host.

The effect of tapeworm infestation on the cat is similar to that given for the dog.

Treatment.

Kamala is used for removing tapeworms from cats. It is given in 10 to 15 grain doses to adult animals, either in a gelatine capsule or in syrup. The dose should be reduced for young and weak animals.

INSTRUCTIONS FOR THE FORWARDING OF PARASITES FOR IDENTIFICATION.

1. Internal Parasites—Worms.

(*a*) The specimens should be forwarded in methylated spirits. A suitable solution may be prepared by adding one volume of water to two volumes of spirits. On no account should the specimens be sent in water only, as the worms will quickly decompose without any preservative.

(*b*) When possible a number of specimens should be sent in order that both males and females be represented.

(*c*) Care should be taken in packing the container for postage. The Postal Regulations specify that sufficient packing be used to absorb any liquid that may escape through the container leaking or being broken.

(*d*) Accompanying the specimens full particulars of the following should be forwarded:—(1) The name of the animal in which the parasites were found; (2) the locality and date; (3) the name of the internal organ infested, whether the lungs, stomach, intestine, liver, &c.; (4) whether the parasite was lying free, attached, or in nodule form; and (5) the condition of the animal affected.

2. External Parasites—Flies, Lice, Fleas, Mites, and Ticks.

Flies.—(*a*) When a good series is obtainable, some specimens may be sent in spirits; the remainder in small boxes packed securely in position with cotton wool and soft paper (tissue paper). If only one specimen is forwarded it should be packed in cotton wool or tissue paper. Care should be taken in packing the specimen securely to prevent any movement, as this would tend to destroy bristles and other small structures useful for the identification of the species. Maggots should be sent alive packed in sawdust or cotton wool, the packing being slightly damped.

(*b*) Fleas, mites, and lice are best forwarded in spirits.

(*c*) Ticks are preferred alive, though, if necessary, they may be sent in spirits or formalin. The males are required and these are usually to be found in the vicinity of engorged and attached females. A good series of specimens representing both adults and young is desired. Care should be taken in detaching ticks as headless specimens are useless for identification purposes. A small drop of kerosene applied to the tick will cause it to fall off the host in a very short time. A good, steady, and patient pull will also yield good results.

(*d*) In all cases the host, locality, &c., should be noted.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Myology of the Pig.

By J. A. RHEUBEN, Inspector of Stock, Brisbane.

IN the "Queensland Agricultural Journal" of February, 1933, an article appeared entitled "Are Sows Better Baconers than 'Barrows'?" The conclusion arrived at in this article leads the writer to describe a muscle existing in the abdominal and pectoral wall of the male pig which is non-existent in the female.

Since the bacon usually preferred by consumers is that in which there is a generous admixture of lean with fat, the presence of an extra muscle in flitches from the male must in consequence give bacon from this sex preference while such a demand exists.

The accompanying plates, showing in (14) the sow opened along the median line and free from any suggestion of muscle, and in (15) a barrow opened similarly showing distinctly between x x the extra existing muscle, proves conclusively the superiority of barrows as baconers.

PLATE 14.

In 1933 the Royal National Association, in an effort to make comparison between the products of foreign exporters of bacon and that of our own State, imported flitches from Ireland, Sweden, Poland, Denmark, and Holland.

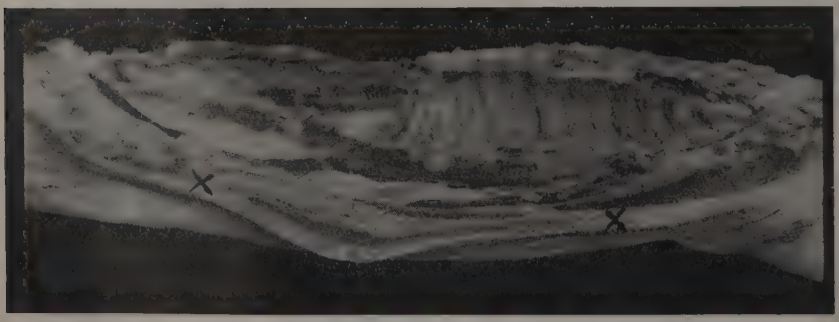


PLATE 15.

Photographs of these flitches appeared in the "Queensland Agricultural Journal," and on examination proved, without exception, to be from females. The photograph of the Queensland flitch, appearing in conjunction with the others, and selected by the writer, is of a barrow.

It would then appear that either the presence of this muscle has escaped the notice of various responsible persons in other parts of the world, or is quite unknown to them. This would, of course, mean that in competition on a market supplied by the bacon of barrows they would consistently take second place.

Plate 16.

Location.—The muscle is situated along the inferior wall of the abdomen, having its anterior insertion at or about the fifth rib, reaching its maximum width of about 8 inches at the umbilicus, and having its posterior insertion at a point in line with the thin flank.

Plate 14 is of a flitch from a sow, and shows no subcutaneous muscle, such as is easily distinguishable in Plate 15 and which is marked x x. This latter photo. shows clearly the extent and location of the muscle, while in Plate 16 the pencil lines show still further its position. In Plate 16 the cross on the median line shows the position of the umbilicus.

After conversation with several veterinarians, and after a careful perusal of several text-books on anatomy, the writer has come to the conclusion that this extra subcutaneous muscle is either unknown or has not been described.

From the carcase point of view, the presence of this muscle is important. Hitherto the usual means of identification were the castration marks and the groove left on removal of the penis; these were removed in dressing, and such identification became difficult. The presence of this muscle, however, enables one to identify the carcase by the flitch.

The writer would be pleased if persons interested would communicate with the Chief Inspector of Stock and inform him if, in their experience, the muscle has been described, and the name of the particular publication.

PLATE 17.—REMOVING SILT FROM DAM, CAMERON DOWNS, HUGHENDEN DISTRICT.

Apple Packing for Export and Home Markets.

By JAS. A. GREGORY, Instructor in Fruit Packing.

PART I.

Export.

THE products of the apple industry of Australia have now become firmly established on the world's markets and meet with the keenest competition with the produce of other lands. It is necessary for all orchardists to adopt the latest methods if we are to keep up with the keen competition offered. To do this we must study all phases of harvesting and packing and use all our skill in producing a finished article that will hold its own in respect to maturity, quality, pack, and attractiveness.

Harvesting.

All apples are not suitable for exporting, and only lead to trouble and loss when sent away. It takes the whole year to grow a case of apples. Why spoil the whole of the labour by carelessness during the last operation? Variety, of course, plays a large part in successful export, early soft varieties, such as Carrington, Gravenstein, and William's Favourite being totally unsuitable. The old rule of "quickly matured, quickly bad," appears to prevail, only the late, long-maturing varieties such as Granny Smith, Stewart's Seedling, and Dunn's giving the best results. Jonathan, Delicious, and some of the other midseason varieties still present a problem in the Stanthorpe district. Codling Moth, Fruit Fly, and Bitter Pit are the main causes of trouble which can be to a great extent eliminated before packing. Growers, by studying the various trees in their orchards, can assist to a great extent in this disease elimination. It is unwise to pack for export from trees which show a high percentage of Codling Moth infestation unless the fruit is immediately cold-stored. It is quite possible for eggs laid on the fruit to develop after packing and cause damage to the consignment. White Oil as an ovicidal spray is an assistance, but has the effect of "fixing" the arsenate of lead residue firmly to the fruit, making it very hard to remove by wiping or other means. Fruit Fly is combated by growers using the ordinary means of control at hand and by exercising care in not packing under artificial light. Care in rejecting during picking is of great assistance and should be practised. "If in doubt throw it out" is a splendid motto to live up to. It is much easier to detect Fly under the natural sunlight whilst picking than whilst packing. It is the picker's job to reject, not the packer's. Bitter Pit, or Stippen, or Cork, as it is sometimes called, is a disease that gives most trouble of all in export consignments. Assisted greatly by immaturity, this disease develops during transit and in storage. Close attention to maturity is necessary. Most growers are rather prone to pick apples on the "green" side, forgetting about the development of Pit. Whilst there are many guides to maturity they are mostly internal guides and unsatisfactory, as all the apples on a tree do not mature at the same time, and whilst some fruit will test alright a high percentage will not. The best guide for the grower appears to be the change in the ground

colour of the individual fruit. Apples naturally green in colour become a brighter and lighter green in colour. Red apples change from a dull reddish ochre colour to a brighter and more crimson red, whilst red and green varieties show a combination of the two changed colours as mentioned. A pressure tester is used for testing maturity in some parts of the world, but has not altogether proved a reliable guide. The darkening of the pips is a sign of maturity, but not always an infallible test, as a dry period of weather will often induce a false maturity by changing the colour of the pips in immature apples. The texture and colour of the flesh when cut and the time it takes for the flesh to go black after cutting are also good guides. The more mature an apple is the longer the flesh takes to go black when cut. The Council for Scientific and Industrial Research, in its Bulletin No. 41 on "Bitter Pit of Apples," gives the following formula for a chemical test:—

Iodine solution for Starch Detection.—

Dissolve 1 gm. potassium iodide and 0·25 gm. iodine in 100 c.c. water, by gently heating if necessary.

Freshly-picked apples are cut across the centre and the fruit applied to the iodine solution. An iodine-starch reaction takes place, causing a discoloration of the flesh of the fruit. Immature fruit shows a greater discoloration than matured fruit, whilst over-matured apples show only a slight discoloration. As these tests are internal they, of course, are not altogether satisfactory from the grower's point of view. Growers are strongly advised not to attempt to export apples from trees carrying only a light crop or from young trees carrying their first normal crop. Mature aged trees will always give the most satisfactory results.

Over-maturity is, late in the season, a thing to be avoided. Green or semi-green apples coloured, such as Granny Smith or Jonathan, which show a change to yellow in the ground colour, should not be packed for export overseas, whilst varieties such as Dunn's and Sturmer which have gone yellow should be carefully tested for over-ripeness. Overseas buyers do not like yellow apples or badly coloured Jonathans, even if they do arrive in a saleable condition. Close attention to these points should assist in making the packing faster and better.

All fruit picked without stalks should be rejected from export consignments, as a large percentage of this fruit will possibly develop rot in the stalk cavity. Tests have proved this. This fruit can be marketed locally without waste of time with more satisfactory results. Granny Smith is a variety prone to shedding its stalk when being harvested, so extra care should be taken when picking. Scald, a cold-storage and transit disease which devlops often in Granny Smith apples, is hard to completely control. The use of oiled wrappers has been proved of great assistance, whilst sweating has also been known to have a beneficial effect.

Sweating.

It is best to get all varieties packed and on the boat as soon as possible after harvesting, with perhaps a possible exception in Granny Smith, which has given satisfactory storage results when sweating has

been practised with quantities stored until August. At the same time it must be remembered that ship storage under difficult conditions for keeping temperatures is vastly different from our established land cold stores; so it is recommended that until something more definite is available growers should endeavour to have the fruit on the ship as soon after harvesting as possible.

Cooling.

Care should be taken to let all fruit cool off after picking, before packing. This is absolutely essential if the fruit is to carry successfully for any distance.

Grading.

This operation is often confused with sizing operations. Grading is actually the sorting of fruit into grades of quality. Growers are advised to pay close attention to this operation, which should be carried out during picking operations. The absence of Black Spot (*Venturia inæqalis*) of the apple in Queensland makes it very easy to grade for quality. Colour standards in export consignments are now used. Grade designations for export have been altered, the use of the titles "Special," "Standard," and "Plain" being replaced by the designations Extra Fancy and Fancy. Colour requirements as follows have been adopted.

Colour Requirements for Various Varieties of Apples.

Solid Red—70 per cent. colour Extra Fancy (35 per cent. Fancy). Varieties: Democrat, Duke of Clarence, McIntosh Red, and King David.

Partial Red—50 per cent. colour Extra Fancy (20 per cent. Fancy). Varieties: Crofton, Geeveston Fanny, Jonathan, Worcester, Pearmain, Yates, Aromatic, Delicious, King Cole, Dougherty, Scarlet, Rokewood, Australian Beauty, Tasman's Pride, Coleman, and Jubilee.

Striped Varieties—30 per cent. Extra Fancy (10 per cent. Fancy). Varieties: Alexander, C.O.P., King Pippin, Pomme de Niege, Ribston Pippin, Statesman, Crow Egg, Nickajack, Prince Alfred, Rome Beauty, Stayman.

Uniform Colour for Variety—Cleopatra, Newtown Pippin, Sturmer, Stone Pippin, French Crab, London Pippin, Mobbs Codlin, Reinnette du Canada, Stewart's, Schroeder, Alfriston, Dunn's, Granny Smith, Wellington, White Winter Pearmain.

Varieties.

A multiplicity of varieties is not recommended for export. The following varieties from Stanthorpe give the best results:—Granny Smith, Stewart's Seedling, Alfriston. Care must be exercised when exporting Jonathan, Delicious, and similar varieties.

The tendency of the export trade is to eliminate many varieties, and good work has already been done in this direction. The following

are the present varieties permitted and the abbreviations of names of fruit which may be used on the cases:—

Method of placing wires around the case. Note bulge on fruit.

Method of placing wiring machine. Observe the amount of overlap allowed the handle of the machine. This allows free movement whilst the wire is being tightened.

List of varieties for export in 1935, together with colour requirements and abbreviations. ("Ex F." means Extra Fancy, and "F" Fancy; "E.C.," even colour):—

DESSERT, 2¼–2¾ INCHES.

Variety.	Colour.		Abbreviation.
	Ex. F. %	F. %	
3 Aromatic	50	20	ARO.
1 Cleopatra	E.C.	E.C.	CLEO.
1 Delicious	50	20	DEL.
1 Dougherty	50	20	DHTY.
2 Geeveston Fanny	50	20	G.F.
1 Newtown Pip	E.C.	..	N.T.P.
2 Ribston Pip	30	10	R.P.
1 Rokewood	50	20	ROKE.
1 Sturmer*	..	E.C.	ST. P.
1 Statesman	30	10	STN.
3 Australian Bty.	50	20	A.B.
Ex. White Winter Pearmain	E.C.	E.C.	W.W.P.
Ex. Stayman	30	10	STAY.
Ex. Coleman	50	20	CMN.
Ex. McIntosh Red	70	35	McINTOSH RED.
Ex. Jubilee	50	20	JUB.
Ex. King Cole	50	20	K.C.

*Note.—Russet Tolerance.

DESSERT, 2–2¾ INCHES.

1 Cox's Orange Pippin	30	10	C.O.P.

DESSERT, 2⅛–2¾ INCHES.

2 King Pippin	30	10	K.P.
1 Crofton	50	20	CROF.
1 Jonathan	50	20	JON.
3 Pomme de Niege	30	10	P.D.N.
2 Worcester Pm.	50	20	W.PM.
1 Yates	50	20	YATES
2 King David	70	35	K.D.
2 Scarlet	50	20	S.PM.

CULINARY, 2⅝–3 INCHES.

1 French Crab	E.C.	E.C.	F.C.

CULINARY, 2½–3 INCHES.

2 London Pip	E.C.	E.C.	L.P.
3 Mobb's Codlin	E.C.	E.C.	M.C.
3 Reinnette du Canada	E.C.	E.C.	R.D.C.
1 Stewarts	E.C.	E.C.	SS.
2 Schroeder	E.C.	E.C.	SCH.
Ex. Wellington	E.C.	E.C.	WTN.

CULINARY, 2½–3¼ INCHES.

1 Alfriston	E.C.	E.C.	ALF.
2 Prince Alfred	30	10	P.A.

DUAL PURPOSE, 2¼–3 INCHES.

	Variety.	Colour.		Abbreviation.
		Ex. F. %	F. %	
2	Alexander	30	10	ALX.
2	Crow Egg	30	10	C.E.
2	Duke of Clarence	70	35	D.C.
1	Dunns	E.C.	E.C.	DUNNS
1	Granny Smith	E.C.	E.C.	G.S.
2	Rome Beauty	30	10	R.B.
2	Nickajack	30	10	N.J.
2	Tasman's Pride	50	20	T.P.
2	Stone Pippin	E.C.	E.C.	S.P.
	DUAL PURPOSE, 2¼–3¼ INCHES.			
1	Democrat	70	35	DEM.

E.C. indicates the *contents of a case must be of even colour.*

Varieties are numbered to indicate their classification as export apples.

No. 1 varieties recommended for export.

No. 2 varieties permitted to be exported, but it is not recommended that trees be converted to these varieties.

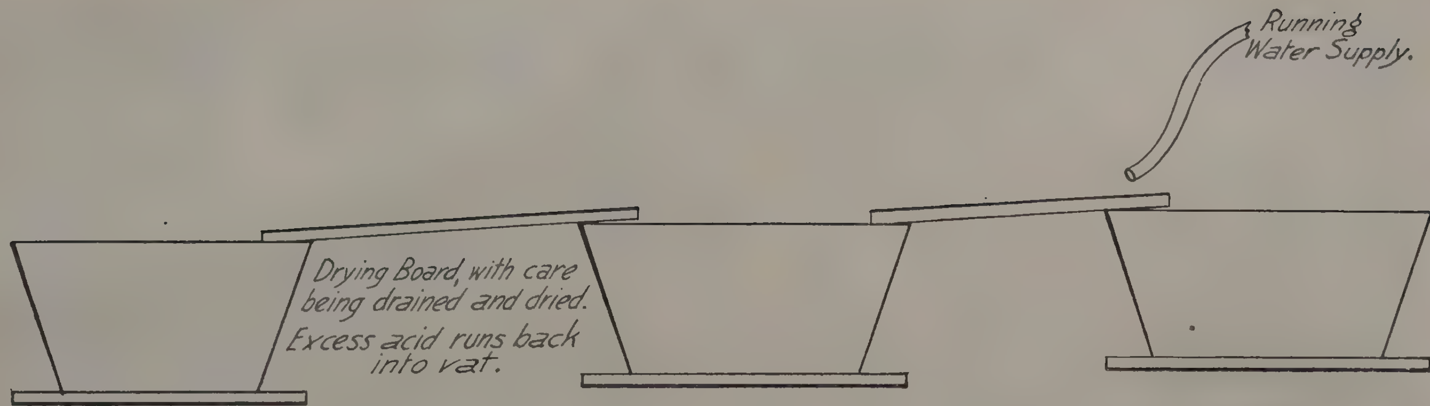
No. 3 varieties permitted to be exported for next two years, but any of these may be subsequently deleted from the export list.

Ex., Experimental.—Varieties permitted to be exported in 1935 in an experimental way, and to be the subject of reports by departmental officials and the fruit trade abroad.

Arsenate of Lead.

Growers are not permitted to export apples which carry too high a percentage of Arsenate of Lead. As mentioned before, Oil spraying in conjunction with Arsenate of Lead has the tendency to fix the lead, consequently making it harder to remove. Any quantity of Arsenic (Arsenious Trioxide As_2O_3) over 0·01 grams to the pound of fruit is not permitted. Many growers use a system of wiping to remove the residue. A rag damped in a weak solution of white oil and water is useful. Arsenate of Lead may be removed by dipping the fruit in a solution of ½ to 1 per cent. of Hydrochloric Acid and allowing it to remain there for two minutes. The fruit is picked into picking boxes kept specially for the purpose. The system of dipping is as follows:—

Two large wooden troughs should be provided, one for the acid solution and one for rinsing water. These troughs should be large enough to hold a case of fruit without removing the fruit from the case. The acid solution is prepared and placed in the first trough (1 gallon of commercial Hydrochloric Acid (33 per cent.) mixed with 64 gallons of water will give a 1 per cent. solution of dipping fluid). The case of fruit is then placed, case and all, in this solution, which should be in sufficient quantity to cover the fruit, and gently kept moving up and down for one to two minutes. The fruit is then removed and placed on a draining rack, which permits the surplus acid to drain back into the acid bath. The fruit is then plunged into the water bath and thoroughly cleansed of acid. This bath (Plate 18) should be supplied with continuously running water. The fruit is then dried thoroughly and is ready for packing. To make the removal of the Hydrochloric Acid even more effective, a third bath of lime (1 lb. to 40 gallons) water) can be used with good effect. This has the effect of neutralising the acid. It is not necessary to rinse the fruit after using the lime bath. Fruit should be treated with this acid bath immediately after picking, so that the effects of the bath are not spoiled by the development of the natural wax



Vat 1.

Hydrochloric Acid. 1 gal. to 64 gals. water.

Vat 2.

Water continuously running for preference.

Vat. 3.

Optional for use. Lime, 1 lb. to 40 gals. water.

PLATE 18.—METHOD OF REMOVING ARSENATE OF LEAD RESIDUE.

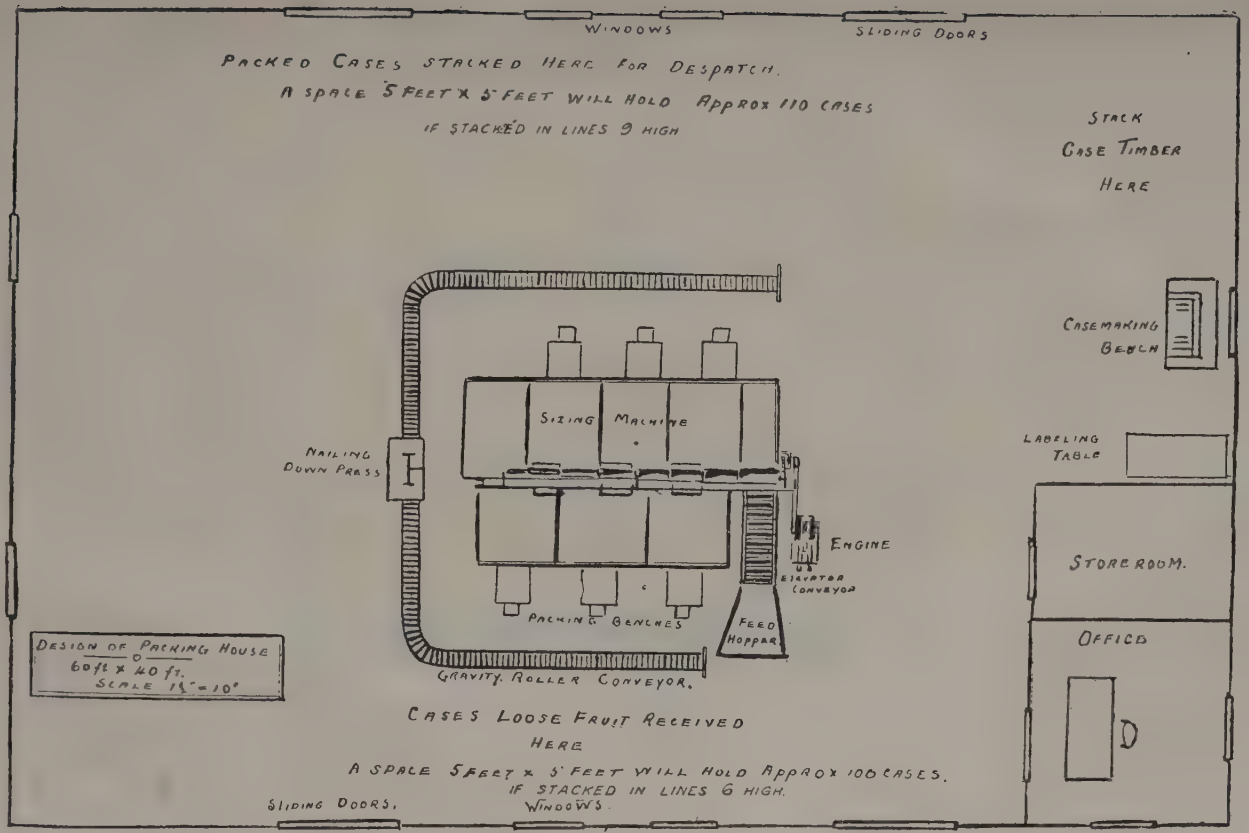


PLATE 19 (Fig. 1).—PACKING SHED LAYOUT.

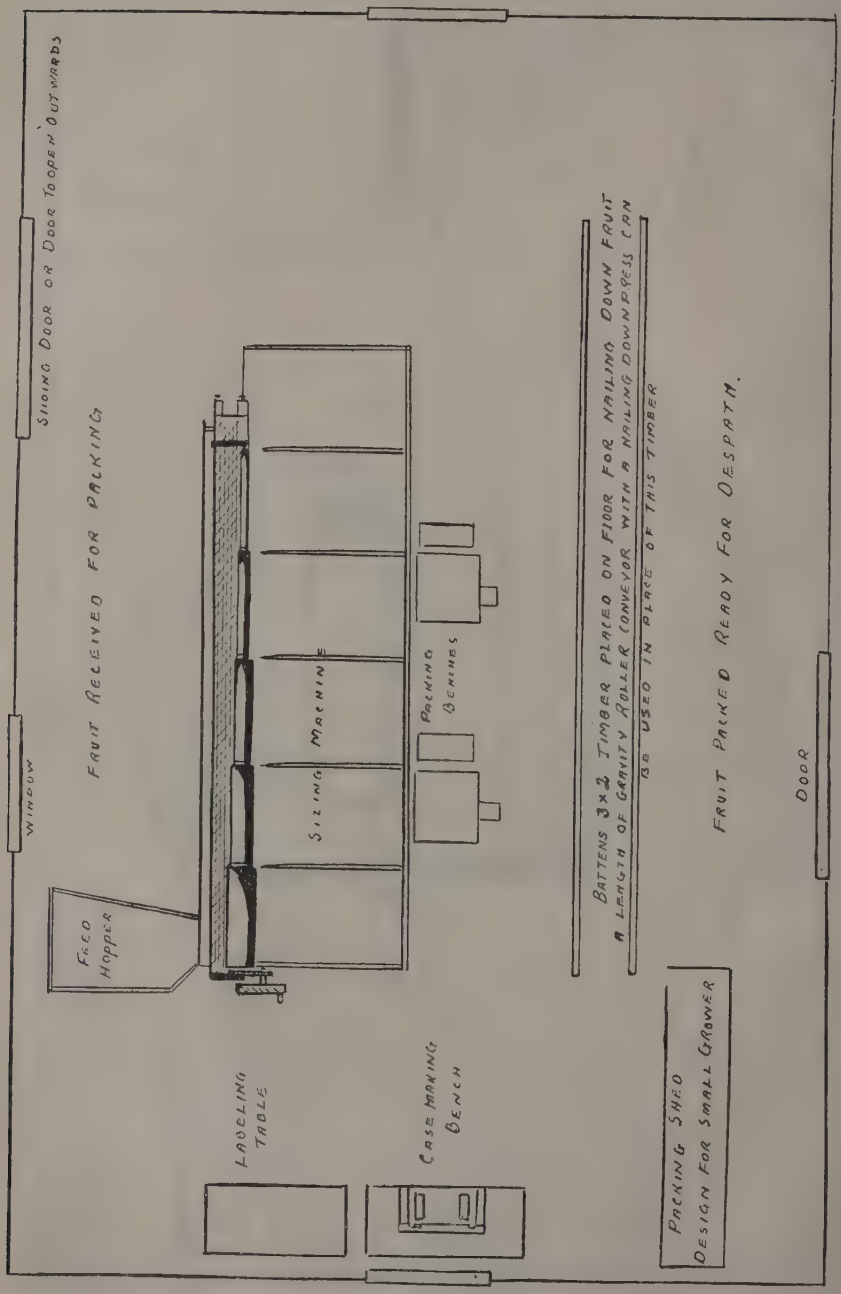


PLATE 20 (Fig. 2).—PACKING SHED LAYOUT.

on the fruit. The treatment is quicker and less costly than hand-wiping and usually adds to the attractiveness of the fruit. Care should be taken when the final lime bath is not used to thoroughly rinse the fruit, as if this is not done it is possible to seriously injure the fruit, the acid collecting in the calyx and stem cavities. Hydrochloric Acid is volatile and will eventually evaporate, but before doing so might injure the fruit. The injury appears as a bleaching of the skin, and shows a depressed area where damage occurs. Frequent changes of rinsing water, or, better still, running water, will overcome this risk. Where arsenic is present the spots turn black. A residue of acid can be readily detected by the tip of the tongue, the acid causing a sharp stinging sensation when coming in contact with the tongue. Care should be taken not to wash fruit with open calyx, as the acid is likely to cause damage to this type of fruit.

Shed Equipment.

Good packing-shed equipment helps to make the work easier and faster. In addition to the plant for washing, packing-shed plant is described. A suggested design for the layout of small packing sheds is given (Plates 19 and 20). This can be modified by growers to suit their own individual sheds. The main consideration is to keep the work moving in one direction, so that time is not wasted by walking around or dodging other work that is in progress. The following is a list of equipment to use in up-to-date Packing-houses:—Sizing Machine and Conveyor, Lidding Press, Case-making Bench, Packers' Stands with Paper Holder and Needle, Packer's Spring Boards, Nail Stripper, Case End Scraper, Stencils, Labelling outfit, including complete set of Rubber Stamps, Sizing Rings, and Roller Conveyors.

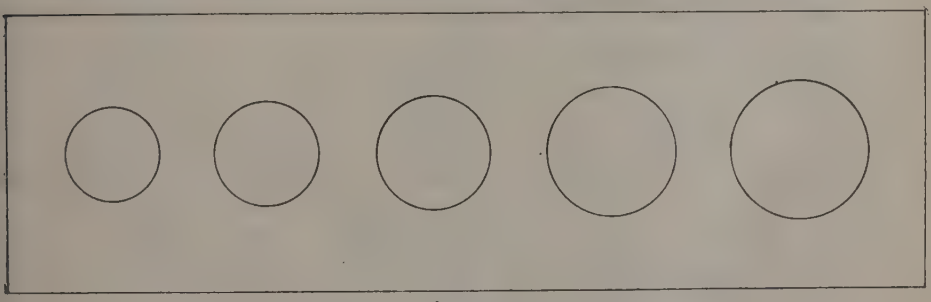


PLATE 21.—HAND-SIZING GAUGE.

The holes can be cut in the plywood with an expansion bit or washercutter, 1½ inch being the distance of the edge of the 3-inch hole from the edge of the board with a distance of 1¼ inch between the edges of each hole.

An up-to-date sizing plant is the first consideration. Apples are fruit that size well when sized by any of the usual commercial sizers, of which many satisfactory types are on the market. Growers will find that a sizing machine will soon repay its cost in time saved. Sizing plants can be procured from £20 upwards. A good case-making bench is another necessity. Many growers make case-making the hardest work during harvesting and marketing. Much time can be saved on case-making. Packing stands are time savers and soon repay their cost.

A lidding press is a well worth while addition to the equipment, particularly where the Standard case is being used.

A useful hand-sizing gauge (Plate 21) can be made from a piece of three-ply, 20 inches by 6 inches, with five holes cut in it with the following diameters:—2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, and 3 inches. The packing counts can be written in alongside of each sized hole. The packer will find this gauge useful when first learning to pack. A description of how to make home-made packing-shed equipment is contained in a pamphlet issued by the Department of Agriculture and Stock, William street, Brisbane. This can be had free on application to the Under Secretary for Agriculture and Stock.

Containers.

Two different cases are used for marketing apples—the Standard case 18 inches long by $11\frac{1}{2}$ inches wide by $10\frac{1}{2}$ inches deep, and the Australian Dump case 18 inches long by $8\frac{2}{3}$ inches wide by $14\frac{1}{4}$ inches deep. Fruit for export is best packed in the Standard box, as this case

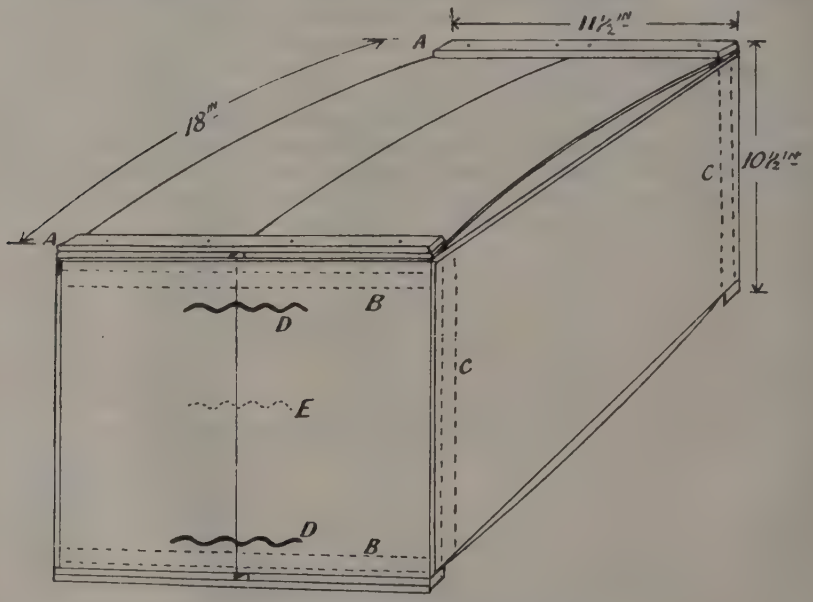


PLATE 22.—SKETCH OF CANADIAN CASE.

Correct method of making the Canadian Standard Case.

The cleats (A) are placed across the ends of the pieces of timber used for the tops and bottoms of the case, and are not used in the position indicated by the dotted lines (B and C). If growers are supplied with a case with two-piece ends, it is suggested that corrugated fasteners (D and E) be used instead of the cleats (B) indicated. Two fasteners (D) to join the two pieces should be placed on one side of the end about 1 inch from either edge, and one fastener (E) in the middle on the opposite side of the end.

is used by all the exporting countries of the world, United States, Canada, New Zealand, and South Africa. This case is also used by English and Irish apple growers to market their fruit on the British markets. The Australian Dump case is used by no other country but Australia. Some

of the States use this case for the Australian trade only, using the Standard case for all export consignments. It will be seen that on the overseas markets the Standard case is, on account of being used generally, the best commercial package for use. From the point of view of the packer the respective merits of both cases are interesting. Both cases lend themselves to doing the diagonal check pack to perfection. The Standard case, being wider, gives the packer more room for working, enabling him to work faster and increase his output. It has a better display value than the Dump case, having a larger face of fruit for display when used for this purpose. Properly made, it takes less nails, requiring thirty-two nails as against forty for the Dump case. Both cases, being the same length, permit of regular stacking in trucks, &c. Care should be exercised by casemakers not to drive the nails through the boards too close to the edges, $\frac{3}{8}$ to $\frac{3}{4}$ inch from the edge being necessary. (Plate 22.) This will, to a large extent, prevent the splitting of boards. Use $1\frac{1}{4}$-inch 14 gauge nails if nailing across the grain, and $1\frac{1}{2}$-inch if with the grain for sides, and $1\frac{1}{2}$-inch 14 gauge for top and bottom. Drive all nails on the screw. The following are the timber specifications for the Standard and Dump cases as required by the Commonwealth Department of Markets before the cases can be used for export purposes:—

Standard Case.

2 Ends, $11\frac{1}{2}$ inches x $10\frac{1}{2}$ inches x inch thick.

2 Sides, $19\frac{1}{4}$ inches x $10\frac{1}{2}$ inches x $\frac{5}{16}$ inch (min.).

4 Tops and 4 bottoms, $19\frac{1}{4}$ inches x $5\frac{1}{2}$ inches x $\frac{3}{16}$ inch.

2 Cleats, $11\frac{1}{2}$ inches x $\frac{3}{4}$ inch x $\frac{5}{16}$ inch (min.).

Dump Case.

2 Ends, $8\frac{3}{4}$ inches x $14\frac{1}{4}$ inches x $\frac{5}{8}$ inch thick.

4 Sides, $19\frac{1}{4}$ inches x 7 inches x $\frac{5}{16}$ inch thick.

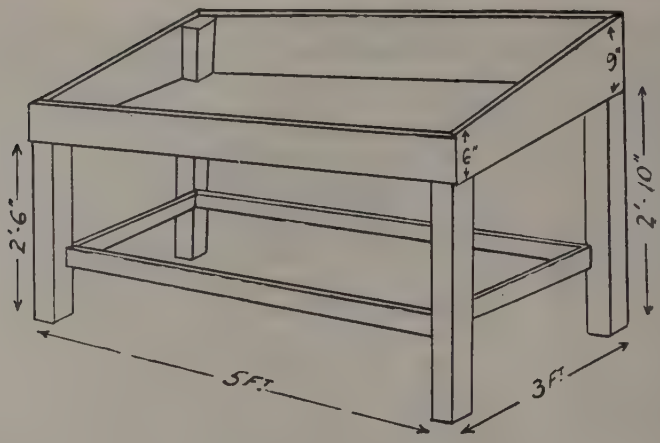
4 Tops and 4 bottoms, $19\frac{1}{4}$ inches x 4 inches x $\frac{1}{4}$ inch thick.

Single tops and bottoms are sometimes used, $19\frac{1}{4}$ inches x $8\frac{1}{2}$ inches x $\frac{1}{4}$ inch thick.

Care should be taken to use only clean, new-seasoned timber for making cases. Softwood is to be preferred to hardwood timber. Casemakers should make sure that openings, between the boards, of not more than $\frac{1}{4}$ inch occur. Wider openings than this are likely to cut the fruit on the edges of the boards. It is also necessary to see that the top and bottom edges of the side boards are not placed more than $\frac{1}{4}$ inch from the top and bottom edges of the end pieces. This will prevent fruit from being cut on the edges of the sides when nailing. Having the ends dressed on one side is an improvement to the case.

Sizing.

Sizing the fruit before packing assists greatly in making packs easy to do and easy to bring to the correct height in the case, although there are packers who find no difficulty in packing unsized fruit by using a roomy bench (see Plate 23) to hold the fruit, tipping one case only on the bench at a time. The packer then packs two different sizes at the same time, and, while packing, sorts the remaining sizes into separate heaps on the bench. Growers who are fortunate enough to have a mechanical sizer will find the operation of packing made easy, provided that care is taken to avoid the pitfalls associated with mechanical sizers. Firstly, it should be remembered that in practically all mechanical sizing machines two different counts of fruit can be packed from each bin, packing being made very easy if this rule is followed. To enable this to be done, it is well to have packing stands of the type illustrated (see



Fruit Bench to assist in Grading.

PLATE 23.

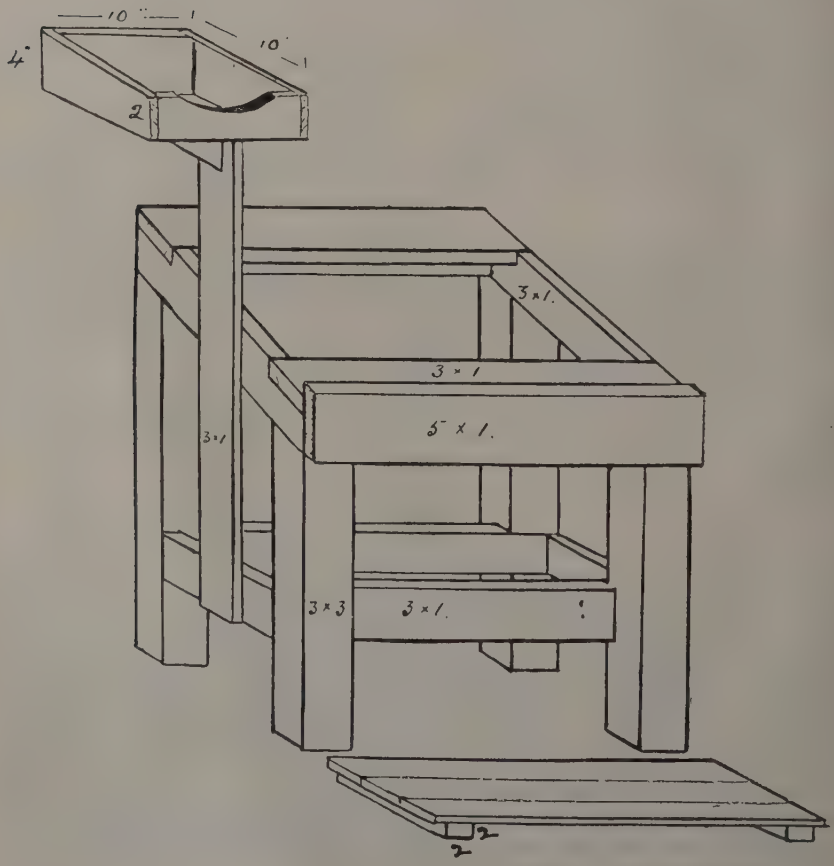


PLATE 24.—PACKING STAND.

Plate 24.) A spring-board of the type illustrated is also helpful in preventing packers from getting aching backs, tired feet, &c.

Fruit is always sized according to the measurement of its diameter, the following sizes being used:—2 inches, 2¼ inches, 2½ inches, 2¾ inches, and 3 inches. Under the Fruit and Vegetables Act no apples are allowed to be marketed in Queensland when under 2 inches in size. The size can be determined by having a sizing gauge as previously mentioned made with these diameters, the apple being placed on the ring with the stalk up. Any apple that will fall through a 2¼-inch ring but not through a 2-inch ring is classified as a 2-inch apple. Likewise, an apple that will go through a 2½-inch ring and not through a 2¼-inch is classified as a 2¼-inch apple. This method is repeated to determine all sizes. A handy gauge can be cut from a piece of three-ply with a washer-cutter or carpenter's expansion bit. (Plate 21.) A few weeks' experience will enable the packer to become so proficient that the use of the rings will become unnecessary. Packers are advised to always pack to a count instead of making up their minds that they will pack to an exact size. When using a mechanical sizing machine, best results are obtained by keeping the rollers at a marked setting, so that the same counts can be packed out of each bin for any particular variety or shape of fruit. After any alteration of the rollers or belts to pack other fruits, the machine can be set back to its original place and the same counts for any particular variety packed from the same bins.

Packing.

The standard diagonal check system of packing is best. This pack has the following advantages:—

All layers will come to an even height in the case. (Plate 25.)

A given size of fruit will always come to the correct height in the case.

The packed fruit will always look attractive, appearing in straight lines diagonally, across, and up and down the case, whether opened on the top, bottom, or sides.

PLATE 25.

The same five apples photographed on their cheek as placed when doing the Standard Cheek pack, and on their stalks as they would be placed when doing other packs. Note the unevenness of height in both layers. This explains the main reason why the cheek pack is preferred by packers.

No two apples will rest upon the other, but in the pockets formed between the fruit of the layer beneath.

The height of the fruit in the case can be governed by making the pockets larger or smaller.

The quantity or number of fruit in the case is always the same for each pack, and can be ascertained at a glance.

It is my intention to, as far as is possible, simplify the packing. With this end in view readers will find that the various packs that can be used have been divided into two groups. One group contains (Plate 28) a list of packs that should be found by packers to be all that is necessary to pack all sizes of most types of fruit. For the Standard case this list embraces (Plate 26) Apple Packs and Counts to use, all the counts that are used by the United States of America, Canada, New Zealand, South Africa, England, and Ireland when marketing on the British and Continental markets. The second group consist of packs (Plate 29) which packers might find of use when a different type of case, such as hardwood, is used. Growers should bear in mind that counts regularly used by the established packing-houses are better understood by buyers, and should use these in preference to intermediate counts.

A fault often noticed in private packing-sheds is the lack of any attempt on the part of packers to provide themselves with equipment to enable them to work fast and in comfort. Proper equipment in packing-sheds soon pays for itself in increased efficiency, enabling a larger output per day to be handled. A pamphlet, "Packing Houses and their Equipment," describing how to make shed equipment, for a small cost, at home during the quiet periods of the year, can be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

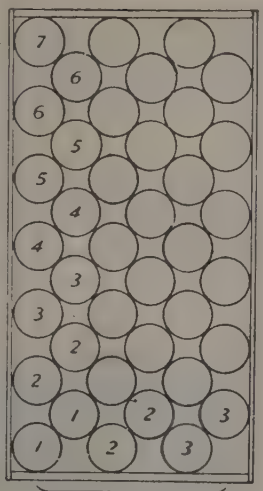
By using the packing-stand illustrated (see Plate 24) the cases are slightly tilted, which helps to keep the fruit in position, thus making the packing much easier. The packer stands with the two cases to be packed into in front of him, with the fruit on one side of the cases and the wrapping paper on the other. The bench with the fruit on should be made tilted to permit the fruit to run to within easy reach of the packer.

The two cases used for apple-packing can be packed correctly by using four different packs. For the Standard box, 18 inches long by 11½ inches wide by 10½ inches deep, the 3—3, 3—2, and 2—2 packs will pack correctly all commercial sizes of fruit. When packing the Dump case the 3—2, 2—2, and 2—1 packs are used. A reference to the packing chart, used in conjunction with a description of packs, will assist the beginner in understanding the difference between the different packs.

3-3 Pack. (See Plate No. 8.)

This pack is only used in the Standard box and is very easy to do if care is taken in placing the first six apples in the first layer. Three of these are placed in a layer across the end of the case with the stalks facing the end of the case farthest from the packers, the first fruit being placed in the left-hand corner and the other two being spaced equal distances apart between the corner fruit and the right-hand side

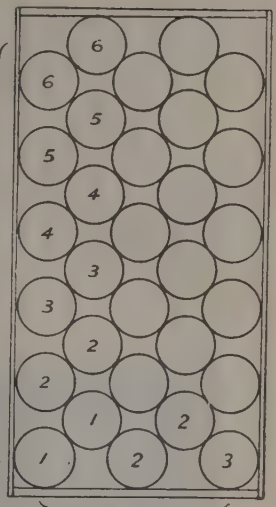
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 7 x 6.



3-3 PACK.

The Pack gets its name from the way the first six fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

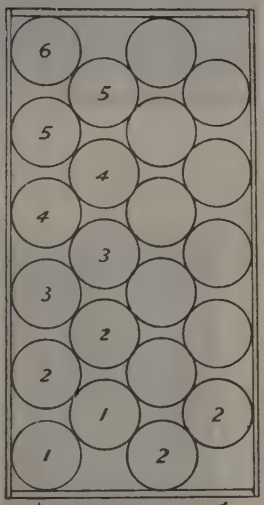
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 6.



3-2 PACK.

The Pack gets its name from the way the first five fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

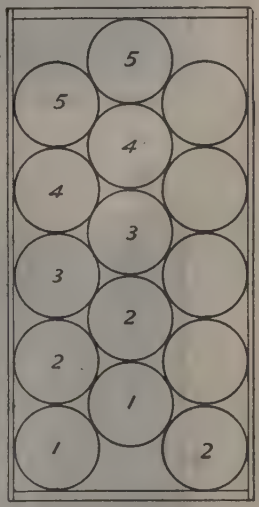
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 5.



2-2 PACK.

The Pack gets its name from the way the first four fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 5 x 5.



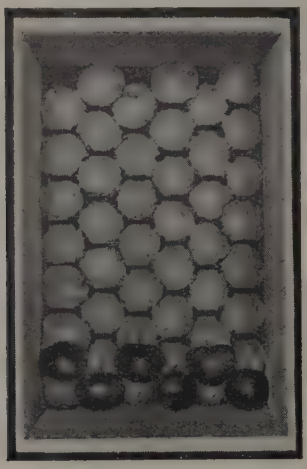
2-1 PACK.

The Pack gets its name from the way the first three fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

PLATE 26.—HOW TO READ AND USE THE PACKING TABLE.

of the box, leaving three spaces of the same size. In the three even spaces between the fruit we place the next three apples, forming the 3—3 from which the pack gets its name. This is repeated until the layer is finished. Care must be taken to see that fruit is placed in straight lines. The layer is then completed by placing lines of three in the spaces between each line of fruit until the last line at the end of the layer is reached. The last three apples are then placed in position but reversed so that the stalk end is facing the packer. The second layer is packed in the same manner as the first, but is placed in the pockets or spaces of the first layer, the finished case requiring six layers to complete the

How to Start the Second Layer, 3-3 Pack.



How to Start the Second Layer, 3-2 Pack.

How to Start the Second Layer, 2-2 Pack.

How to Start the Second Layer, 2-1 Pack.

NOTE.—The Apples of the Second Layer fit into the pockets of the First Layer.

PLATE 27.—PACKING ILLUSTRATED.

pack. The same rule of placing the stalk end of the fruit inwards applies in all of the packs, as it prevents the end line of fruit when they are long-stalked varieties from having the stalks squeezed into the fruit by the pressure of the end.

3-2 Pack.

In the 3—2 pack the first layer is started by placing an apple in each corner of the case and one exactly midway between them facing end to end in the case, the stalks facing from the packer. In the Dump case all the stalks face the packer. This forms a line of three apples with two spaces, or pockets, between them. The pack is continued by placing two apples in these spaces, which leaves three pockets between the two apples. We repeat the placing of three apples in these pockets, and then alternately two and three until the layer is finished, except for the last line of fruit; this is reversed with the stalks facing the packer. To start the second layer place two apples in the pockets formed by the first three apples of the first layer, then two and three alternately, the stalks facing as in the first layer, until all the pockets of the first layer are filled, again reversing the last line of fruit across the case. This process is repeated layer by layer until the case is filled. The Standard case requires five layers, the Dump case seven, to complete.

2-2 Pack.

This pack is started by placing an apple in the bottom left-hand corner of the case and midway between this apple and the right-hand side of the box a second apple, leaving two pockets between the two in which the next two apples are placed, thus forming the 2—2 from which the pack derives its name. This is then repeated, the apples being placed facing as in the 3—2 pack until the layer is finished with all but the last line of fruit. In the Dump case all stalks face the packer; in the Standard case this is reversed. The second layer is started by placing two apples in the pockets formed by the first two of the first layer, the layer being finally finished by placing apples in all the pockets of the first layer and reversing the last line of fruit as in the first layer. By repeating this process layer by layer the case is finished. The Standard case is completed with four layers, the Dump case requiring six.

2-1 Pack.

This pack is used only for the Australian Dump case. The rule of placing the stalk end of the fruit to the packer applies. The pack is started by placing an apple in each corner of the case, which leaves a space between the fruit. A third apple is placed in this space or pocket, which gives us two and one, from which the pack derives its name. The process is then repeated to complete the layer. The second layer starts with one apple placed upon the pocket between the first two of the first layer, followed by two, one, two, until the layer is finished. The case is completed by repeating further layers in the manner of the first and second layers, packing until full, the case containing five layers when completed.

APPLE PACKS AND COUNTS TO USE FOR THE CANADIAN STANDARD CASE.

18 inches long x 11½ inches wide x 10½ inches deep.

Packs to use for Conical and Round Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2 inches	3—3	7—7	6	252
2⅛ inches	3—3	7—6	6	234
2¼ inches	3—3	6—6	6	216
2⅜ inches	3—3	6—5	6	198
2½ inches	3—3	5—5	6	180
2⅝ inches	3—2	7—6	5	163
	3—2	6—6	5	150
2¾ inches	3—2	6—5	5	138
2⅞ inches	3—2	5—5	5	125
3 inches	3—2	5—4	5	113
	3—2	4—4	5	100
3¼ inches	2—2	6—6	4	96
	2—2	6—5	4	88
	2—2	5—5	4	80
	2—2	5—4	4	72
	2—2	4—4	4	64

The counts are standard on the worlds markets, being used by United States of America, Canada, New Zealand, England, and Ireland.

Packs to Use for Flat Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2 inches	3—3	8—8	6	288
2⅛ inches	3—3	8—7	6	270
	3—3	7—7	6	252
2¼ inches	3—3	7—6	6	234
	3—3	6—6	6	216
2½ inches	3—2	8—8	5	200
	3—2	8—7	5	188
2⅝ inches	3—2	7—7	5	175
	3—2	7—6	5	163
2¾ inches	3—2	6—6	5	150
	3—2	6—5	5	138
3 inches	3—2	5—5	5	125
3¼ inches	3—2	5—4	5	113
3½ inches	2—2	7—6	4	104
	2—2	6—6	4	96
	2—2	6—5	4	88
	2—2	5—5	4	80
	2—2	5—4	4	72
	2—2	4—4	4	64
	2—2	4—3	4	56
	2—2	3—3	4	48

The counts are standard on the world's markets, being used by United States of America, Canada, New Zealand, England, and Ireland.

PLATE 28.—APPLE PACKS AND COUNTS.

Alternate packs may be used when packing hardwood cases, which do not bulge easily on the top and bottom.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2⅛ inches	3—3	9—8	5	255
	3—3	8—8	5	240
2¼ inches	3—3	8—7	5	225
	3—3	7—7	5	210
	3—3	7—6	5	195
2½ inches	3—2	6—6	6	180
	3—3	6—5	5	165
	3—3	5—5	5	150
2¾ inches	3—2	6—6	4	120
3 inches	3—2	6—5	4	110
	3—2	5—5	4	100
3¼ inches	3—2	5—4	4	90
	3—2	4—3	5	88

These packs should not be used at any time for export overseas.

PLATE 29.—ALTERNATE PACKS.

PACKS TO USE WHEN USING THE AUSTRALIAN DUMP CASE.

18 inches x 8⅝ inches wide x 14¼ inches deep.

FOR CONICAL OR ROUND APPLES.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2¼ inches	3—2	7—7	7	245
	3—2	7—6	7	228
	3—2	6—6	7	210
	3—2	6—5	7	193
2½ inches	3—2	5—5	7	175
	3—2	5—4	7	158
	2—2	7—6	6	156
	2—2	6—6	6	144
2¾ inches	2—2	6—5	6	132
	2—2	5—5	6	120
3 inches	2—2	5—4	6	108
3¼ inches	2—1	6—6	5	90
	2—1	6—5	5	83
	2—1	5—5	5	75
	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53

PLATE 30.—PACKS FOR AUSTRALIAN DUMP CASE.

Australian Dump Case Packs for Flat Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2¼ inches	3—2	8—8	7	280
	3—2	8—7	7	263
	3—2	7—7	7	245
	3—2	7—6	7	228
2½ inches	3—2	6—6	7	210
	3—2	6—5	7	193
	3—2	5—5	7	175
	2—2	8—7	6	180
2¾ inches	2—2	7—7	6	168
	2—2	7—6	6	156
	2—2	6—6	6	144
	2—2	6—5	6	132
3 inches	2—2	5—5	6	120
	2—2	5—4	6	108
	2—1	7—7	5	105
3¼ inches	2—1	7—6	5	98
	2—1	6—6	5	90
	2—1	6—5	5	83
	2—1	5—5	5	75
	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53
	2—1	3—3	5	45

PLATE 30—*continued.*

A close examination of the packing-tables given will be of assistance. These will be dealt with separately for both cases. To simplify the packing as much as possible the packs will be divided into two sections for each case, one table giving the open pocket packs to use, the second giving the pocket packs which can be used but are not recommended.

Packing the Australian Dump Case.

The dimensions of the Australian Dump case are—18 inches long by 8⅝ inches wide by 14¼ inches deep. The timber for this box should be cut with the sides of a minimum thickness of five-sixteenths of an inch, with the tops and bottoms a quarter of an inch thick. Unlike the Standard box, no cleats are used. The finished case should have a bulge of ½ inch to 1 inch on the top and bottom of the case when packed. Three packs are used to pack this box—the 2—1, 2—2, and 3—2.

By calculating the height the fruit will come to in the case two or three layers before the top is reached, the packer, by applying the rule "The size of the pockets governs the height of the fruit in the case," can bring the fruit either higher or lower as required. This is done by making the pockets smaller by slightly increasing the size of the fruit and placing it on a bigger angle, bringing the fruit higher in the box to correct a pack which will come too low, or, in the case of a pack that is coming high, to open the pockets by reducing slightly the size of the fruit and placing it more at right angles to the side of the box. Usually the fault of the fruit coming to the wrong height is caused by a variation in sizing the fruit in the subsequent layers after placing the first layer into

position. Cases not of the correct width are often the cause of trouble in bringing the pack to the correct height, but by following the rule governing the size of the pockets this difficulty may generally be overcome satisfactorily. It should be remembered that it is an offence against the Fruit and Vegetables Act to market fruit in under-sized cases. The Export Regulations also control the size of cases used.

The Same Fruit.

Both cases opened on the side.

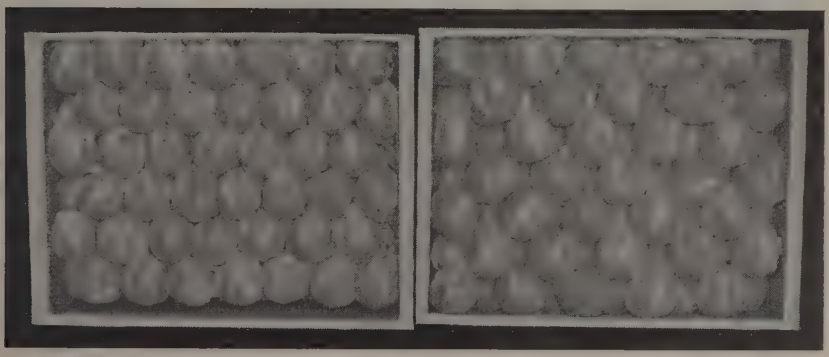


Plate 31.—Side View of Pack.

Count 175, 3-2 Pack. Correct Height.

Count 168. 2-2 Pack. Note space between top layer and lid.

2½ inch apples, round or conical in shape, will not come to the correct height when packed 2-2 pack, 7-7 layers, count 6 layers 168, but if packed 3-2 pack, 5-5 layer count 7 layers 175, no trouble should be experienced.

The Same Fruit.

Both cases opened on the side.

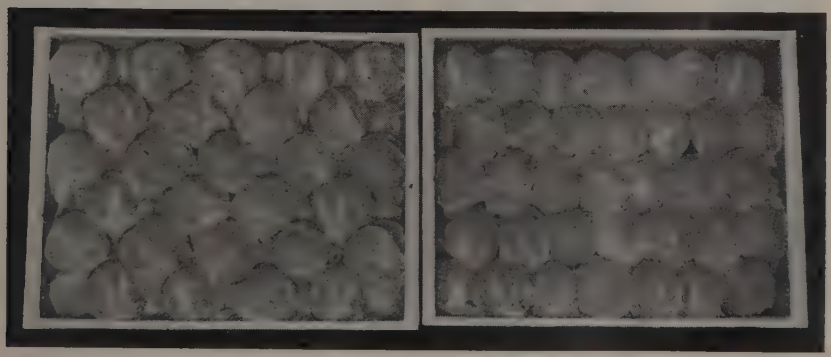


Plate 32.—Another Side View.

2-2 Pack, 5-4 Layer. Count 6 Layers. Correct Pack.

2-1 Pack, 7-7 Layer. Count 5 Layers, 105. Low Pack.

3 inch apples packed 105 count 2-1 with 6 layers is too low, but when packed 2-2, 5-4, 108 count comes to the correct height. Compare height of fruit with distance from lid.

Packing the Standard Case.

The Standard case is more convenient to pack than the Dump case, allowing the packer more room to work, due to its extra width. Care should be taken to see that the timber specifications are strictly adhered to, as the whole success of the case depends on its being correctly milled and made up. The 3—3, 3—2, and 2—2 packs are used to pack this box. The finished case should be packed 1½ inches above the top of the case at the centre of the layer with a natural bulge being formed causing the ends to be lower than the centre. Where the case is packed on a packing-stand that does not permit the bottom of the case to bulge slightly while being packed the height of the centre of the top cover above the top of the case should be up to 2 inches. A bulge of this size will give a complete bulge top and bottom of approximately 1 inch when nailed down.

Packing for Local Market.

The same attention to detail should be given to packing for local market. Cases are sometimes lined with clean white paper, but this is unnecessary where wrapping is practised and cardboard guards are used. If corrugated cardboard guards are not used unwrapped fruit should be packed in paper-lined cases to prevent case pressing and rubbing. Clean plain white or coloured paper should be used. Wrapping is always recommended in preference to packing fruit without wraps.

Case-marking Abbreviations for Apples.

The following case-marking abbreviations for apples have been arranged by Australian Departments of Agriculture:—

Variety.	Abbrev.	Variety.	Abbrev.
Adam's Pearman	A.P.M.	London Pippin (Five Crown)	L.P.
Alexander	ALEX.	Lord Nelson	L.N.
Alfriston	ALF.	Lord Suffield	L.SF.
Allington	ALN.	Lord Wolseley	L.W.
Aromatic	ARO.	McIntosh Red	McRED.
Ben Davis	BEN D.	Mobb's Codlin	MOB.
Bismarck	BIS.	Newtown Pippin	N.P.
Black Ben Davis	B.B.D.	Nickajack	NICK.
Buncombe	BUN.	Perfection	PFN.
Cleopatra	CLEO.	Prince Alfred	P.A.
Commerce	COM.	Ranelagh	RAN.
Cox's Orange Pippin	C.O.P.	Ribstone Pippin	RIB.
Crofton	CROF.	Reinnette de Canada	R/C.
Crow's Egg	C.E.	Rokewood	ROKE.
Delicious	DEL.	Rome Beauty	ROME.
Democrat (*see* also Tasma)	DEM.	Rymer	RYM.
Dougherty	DHTY.	Scarlet Nonpariel	S. NON.
Duke of Clarence	D.C.	Scarlet Pearmain	S.PM.
Dumelow (Wellington Pippin)	DML.	Senator	SEN.
Dunns	DUNNS.	Spitzenberg	SPTZ.
*Fameuse	FAM.	Statesman	STATE.
Fanny	FNY.	Stayman (Stayman Winesap)	STY.W.
Five Crown (*see* London Pippin)		Stewart's Seedling	S.S.
		Stone Pippin	STONE
Foster	FOS.	Strawberry Pippin (Winter Strawberry)	STR. P.
French Crab	F.C.	Sturmer Pippin	ST. P.
Granny Smith	G.S.	Tasman's Pride	TAS. P.
Gravenstein	GRAV.	Tasma (*see* also Democrat)	TASMA
Hoover	HOOV.	Thompson's Seedling	T.S.
Jonathan	JON.	Worcester Pearmain	W. PM.
King David	K.D.	Yates	YATES.
King of Pippins	K.P.		

*Known as Fanny in New South Wales.

Wrapping.

We hear of right-hand and left-hand wrappers. Either in the writer's opinion can be correct. A packer should always handle the fruit with the hand that he naturally uses. As an illustration, a man who naturally uses his right hand should handle the fruit with this hand and pick up the wrapping-paper with his left hand. Picking up the wrapping paper is only a mechanical operation and can soon be acquired using either hand. On the contrary, picking up fruit to pack is more than mechanical, as the element of instinct in picking up the correct size to pack enters into it. Good packers size correctly largely by this instinct of feel. This naturally should be more highly developed in the hand that it is natural to use, so that the greatest efficiency should be attained by natural right-handers picking up the fruit with the right hand. Packers should practice placing the fruit in the case with both hands. Common Sulphite wraps are glazed on one side. This side should be placed up in the paper-holder, so that when the fruit is wrapped the glazed or shining side is on the outside.

Method of Wrapping.

Place wraps in the paper-holder, glazed side up. A rubber finger stall may be worn on the forefinger of the left hand, as by its use single wraps are picked up easily. The wrap is picked up with the left hand, one corner pointing towards the packer, the centre of the wrap in the centre of the palm. At the same time an apple is picked up with the right hand.

The apple is thrown into the wrap with some force in order to jerk up the edges of the wrap around the apple. The apple strikes on its cheek in the centre of the wrap, with its stem end pointing midway between the thumb and index finger. As the apple is caught the thumb and fingers of the left hand are closed about the apple, forming a cup, and remain in this cupped position throughout the wrapping process. As the apple is thrown the right hand advances towards the blossom end of the fruit with fingers together and thumb extended at nearly right angles to fingers. The index finger is up and the little finger is down. The lower corners of the wrap are brushed closely over the apple with the thumb and forefinger of the right hand, bringing all corners of the wrap tightly together at the top, except the corner between the thumb and forefinger of the left hand.

Now, holding the apple tightly within the wrap with the thumb and forefinger of the right hand, both wrists are twisted towards the right. The apple turns within the cup formed by the left hand, the fingers of the left hand moving between the apple and the fingers of the right. The hands are turned completely over, until the back of the left is upward and the back of the right is downward.

The apple is now held in the cup formed by the left hand, with its stem pointing between the second and third fingers, and is placed in the box with the tails of the paper downward, while the right hand reaches for another apple. The positions illustrated are described in detail, but it must be understood that, when wrapping, these positions blend into each other so rapidly that an expert packer appears to be picking up apples with his right hand and paper with his left, and placing the wrapped apple in the box. It is readily seen that

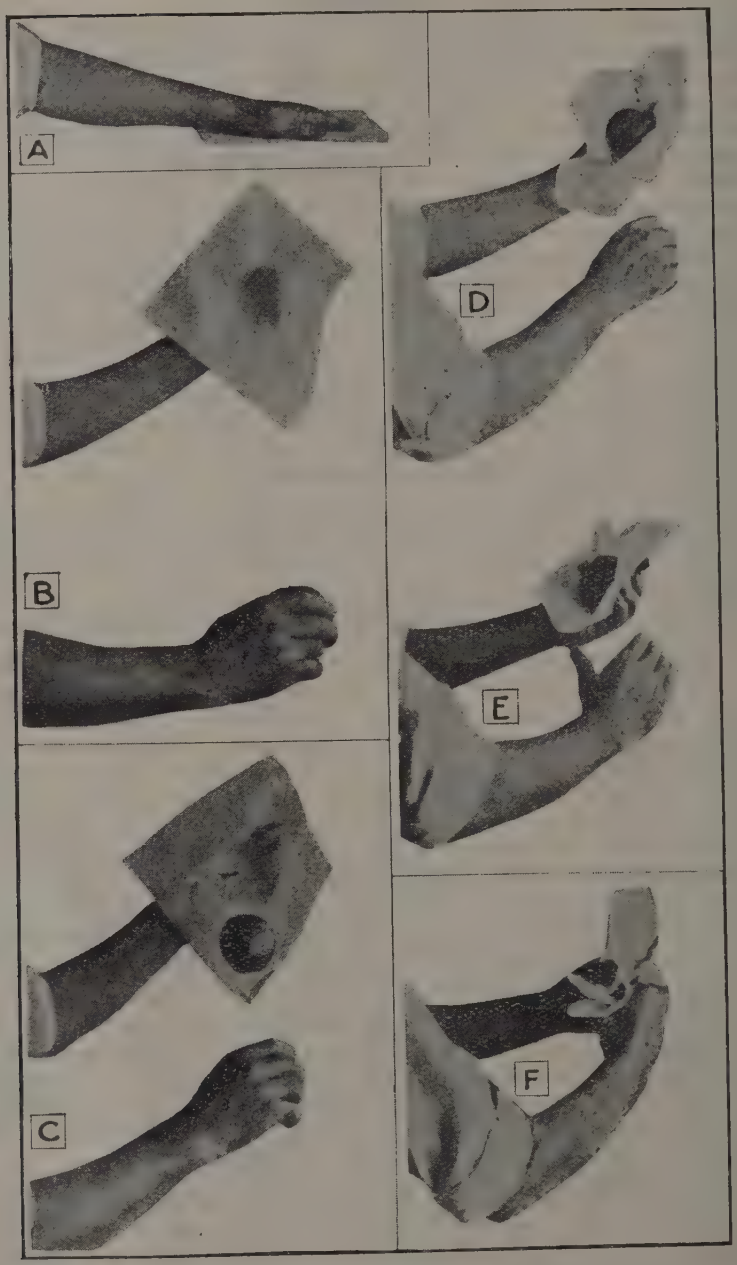


PLATE 33.—METHOD OF WRAPPING AN APPLE.

(A) Picking up the wrap; (B) Picking up the apple; (C) Throwing the apple into the wrap; (D) Position of apple when striking wrap; (E) Wrapping process, first stage; (F) Wrapping process, second stage.

if the wrap is picked up with the right hand and the apple with the left the motions would be reversed. Most apple packers use the general method described, although there are some variations in the details. Beginners should be warned against forming habits in the operations which result in lost motion, for such habits are difficult to overcome. Experienced packers will pack apples about as fast as they can pick them out of the bins. The average packer will pack from 100 to 125 boxes of machine-sized fruit in a day, but packers have been known to pack over 200 boxes in ten hours.

Packers on no account should use the grab pack, which is done by picking up a sheet of paper in one hand, then grabbing an apple with the sheet of paper still in the hand, giving the paper a rough twist with

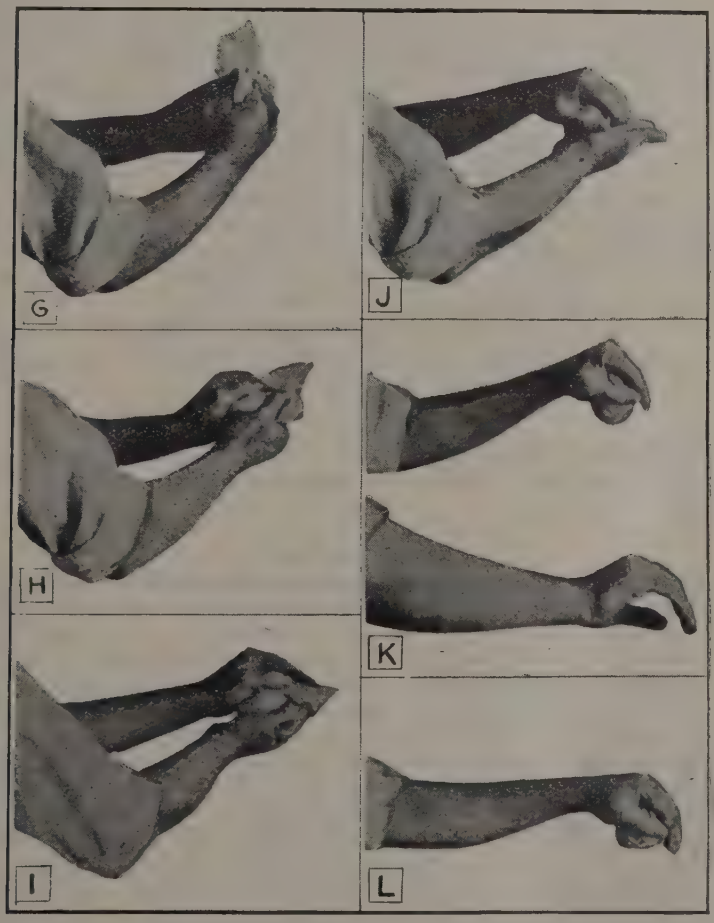


PLATE 34.—METHOD OF WRAPPING AN APPLE—*continued.*

(G) Apple held tighly in right hand, pressing apple against cup formed by left hand; (H) Apple turned within cup formed by left hand, both wrists turning toward right; (I) Hands turning over completely; (J) Back of left hand upward back of right hand downward; (K) Apple ready for placing in box, right hand reaching for next apple; (L) Placing wrapped apple in box.

the other hand, and placing it in the case. This pack usually leads to an untidy-looking packed case.

Wrapping has many advantages, some of which are—

(*a*) It prevents the spread of rots and mould in transit;

(*b*) Prevents individual fruit from being bruised;

(*c*) Gives a snug pack, making the keeping of the fruit in each layer easier, thus enabling packing to be done at a faster rate;

(*d*) Gives a better appearance to the finished package; and

(*e*) With fancy wraps has a better advertising value.

Wrappers.

Fancy wraps are another extra that usually amply repays the cost. Growers should remember that it is of little use using fancy wraps and coloured labels if the operations of grading and packing are not well carried out. Labels and wraps can be of immense value to good consignments, but they will also react the other way if the best is not put into the quality of the fruit, &c. Many growers who are not in the position to have fancy wraps printed, to get away from the ordinary methods use coloured wrappers. These are attractive and well worth while. It is essential that all consignments of fruit overseas be carefully wrapped. Oiled wraps to control scald are strongly recommended for Granny Smith and Jonathan. The following sizes of paper are recommended for use:—

2 in. to 2½ in. apples— 9 in. x 9 in. = approx. 2,880 sheets to 7 lb. ream.

2⅝ in. to 2⅞ in. apples—10 in. x 10 in. = approx. 2,300 sheets of 7 lb. ream.

3 in. and over—11 in. x 11 in. = special size.

(This size of apple is not suited for export.)

The packs shown for each shape have been thoroughly tried out in the Stanthorpe district over a four-year period and should present no difficulty.

Case "Get-up."

Having taken care in packing, growers should complete a good job by giving careful attention to the outside appearance of the finished case. A well-chosen fancy label is an attraction and an asset, being a cheap advertising medium, the average coloured label costing very little. Growers not marketing fruit in sufficient quantity to warrant an outlay on labels may still make their cases look attractive by neat stencilling. Where growers as individuals are not in the position to obtain labels, an economical means of obtaining the use of a label is for a number to join together and obtain a designed label with a common district brand design, only the grower's name and address (which could be added by rubber stamp) differing on each grower's label. This enables a quantity of labels to be procured, thus cheapening the cost. A label must have the grower's or packer's (i.e., packing house) name or brand and address, the address to include the word "Australia" in ½-inch letters. Spaces should also be left to include the variety, number or size of fruit, and grade standard; rubber stamps can be procured to insert these particulars after packing. It is recommended to brand on the label the count in preference to the size. Labels made 8½ by 11 inches in size will fit either the Standard or the Dump case end.

Label Paste.

Good flour paste is satisfactory for applying labels. The paste is applied to half a dozen case ends at a time. The labels, which are soaked in a can of water, are drained and given an application of paste on their backs, placed on the pasted ends, and gently rubbed with a damp rag. A satisfactory paste is made from flour as follows:—Take 1 lb. of flour, ½ oz. alum, and 1 pint water. Mix into a thick paste and then add boiling water until the paste thickens, stirring all the time. If too much boiling water is added, making the paste too thin, boil slowly, adding a little more flour. If to be used immediately the paste can be made without the alum, or by adding a small quantity of bluestone as a preservative can be kept for short periods. If bluestone is added, use only an enamel or glass paste container to prevent corrosion.

If using stencils only and marketing in Queensland, under the Fruit and Vegetables Act it is necessary for the packer to brand his initials, name and address, legibly and durably within a space measuring not less than 5 inches long by 2 inches wide. The name of the variety of fruit and the size or count must also be branded in letters of not less than half an inch in height. When sending overseas the word "Australia" must be included in the address.

Cases should be branded so that as little confusion as possible is caused to loaders and checkers during transit. A good system is to brand as follows:—

One End—Shipping or Agent's Number.

Examples:

409 LONDON

(Export)

W.A. 12 BRIS.

(Local)

Opposite End—Grower's name and address, Variety, Number, and Grade.

Example:

J. JONES, Stanthorpe, Queensland, AUSTRALIA. EXTRA FANCY. G.S. APPLES 125

(Export or Local Market)

Good branding should be neat, and should not show stencil ink smudges from running the brush over the edges of the stencil plate; make your stencils with a good margin around the lettering to prevent this.

Wire Strapping.

Wire strapping the packed case is always recommended. Wire strapping is an insurance against ullage and damage from bad handling. Some packers are not careful about this operation. The wires should be put on the cases neatly, running parallel with the edge of the end of the case. The wire should be placed around the box just off the inside edge of the end of the case. Wires placed too near the centre of

PLATE 35.—METHOD OF PLACING WIRES AROUND THE CASE. (Note bulge on fruit.)

the case are likely to pull the timber in too tightly and damage the fruit. When there is a bulge on the case they are not able to grip the timber of the box unless put on too tightly with the consequence as the fruit shrinks and the bulge gets smaller the wires become loose and are easily removed, thus defeating the object for which they were intended. When wiring, the machine should never be placed on the lid or bottom but on the side where there is no bulge.

Export Requirements.

Growers intending to export should make themselves familiar with the following:—Export Regulations embracing the requirements for Fruit, Cases, and Packing.

I have dealt with the requirements for harvesting, disease elimination, and quality. A copy of the Grade Standards may be procured from the Department of Commerce, 419 Collins street, Melbourne, C1. This should also embrace the casemaking requirements for case timbers, corrugated cardboard, and woodwool, branding, &c. It is necessary that all cases packed for export be lined, top, bottom, and sides, with woodwool or corrugated cardboard, which can be specially procured cut to size. The modern corrugated cardboard is recommended in preference to woodwool. Care must be taken to place the corrugations turned outwards away from the fruit, otherwise marking of the fruit will take place

during transit. An advantage corrugated boards have over woodwool is that the use of the boards cannot be abused in the same manner as woodwool through placing too much on the bottom and top of the fruit. Woodwool is often used with a thick layer placed on the top and bottom of the fruit to make up a deficiency of fruit through bad packing. Where practices of this nature are used the obvious result is shortage of weight in the fruit, which must of necessity cause dissatisfaction overseas. Buyers overseas expect a minimum weight of 40 lb. to the case when packed, a weight which is easily obtainable with good packing. Consignments for local market occasionally show this abuse of the correct use of woodwool, to the detriment of prices.

Plate 36.—Method of Placing Wiring Machine.
(Observe the amount of overlap allowed the handle of the machine. This allows free movement whilst the wire is being tightened.)

Nailing Down.

Care must be taken when nailing down to place battens beneath each end of the case to allow the bottom boards to bulge when the pressure is applied to the fruit. A case-lidding press properly used is a fine implement for shed use. Where cleats are used for the Standard case they sometimes have a tendency to dry and split when nailed. This can be overcome by placing the cleats in a container of water a few minutes before nailing. Nails should be nailed through both cleat and timber of the lid of the box, the same nails being used to nail both.

Stacking in Trucks and Carts.

It is often noticed that growers and carters do not take care in carefully stacking packed cases in trucks and on carts. Cases should always be stacked on their sides where there is no bulge, the thicker timber giving added protection to the fruit. Carters or salesmen should

on no account use cases of packed fruit to sit on when driving along or selling. All of these faults have been noticed by the writer during his travels through orchards, railway-yards, packing-sheds, and markets.

Essential Points to Observe for Packing Successfully for Market and Storage.

1. Handle all fruit carefully during all operations.

2. Pick only matured fruit of good quality and count for the variety.

3. Remove all rejects as far as possible in the orchard and on the sorting conveyor before the sizing operation takes place.

4. Eliminate the marketing of all unprofitable unpopular varieties.

5. Always do standard packs and counts that are known to the buyers.

6. Keep all machinery and buildings thoroughly cleaned up of waste and fly-stung fruit. Spray working parts with a 5 per cent. solution of water and formalin periodically.

7. See that all nails, splinters, screw heads, or other projections on cases, sizing machines, &c., are removed.

8. Make sure that all corners and sides of sizing bins are padded.

9. Have sizing machines running at the correct speed for the particular type of apple, flat or deep, that is to be sized.

10. Wrap all consignments where possible and always when they have to travel any distance.

11. Place corrugated boards on top, bottom, and sides of cases.

12. Take every care when handling and stacking packed cases.

Storage.

Storage may be divided into two classes, common storage and cold storage. The Stanthorpe district's cold dry-aired winter climate permits of some varieties giving fair results with common storage. Granny Smith, Dunn's, and Stewart's Seedling are the varieties that can be handled under these conditions. This type of storage becomes risky and wasteful after eight weeks and is not commercially advisable. Only small lots should be kept and care should be taken to see that the boxes have a free circulation of air all around, the bottom boxes being stacked on battens to permit this. Green varieties stored in this way turn to a yellow colour which is not popular with buyers. The fruit also becomes greasy and if care is not taken light dust from the air will adhere to it, spoiling the general appearance for marketing. Before stacking fruit for storage all floors and walls whereon or whereby the fruit is stacked should be sprayed with a 5 per cent. solution of Formalin to destroy any traces of rots or fungi that may have accumulated from damaged or waste fruit running over the floors, &c.

Commercial Cold Storage.

Cold storage consists of two systems, air circulation or direct expansion. Both systems have points to recommend them. It is considered by many that the direct expansion system does not cause the same amount of shrinkage in the fruit as the air circulation. This

remains to be proved. The main essential for successful storage is harvesting the fruit at the correct time. All apples must be fully matured for successful storage, although care must be taken to see they are not overmatured. Overmatured fruit has only a short storage life before internal breakdown takes place. Immature fruit is more prone to develop Bitter Pit and Apple Scald. Stanthorpe apples appear to have only a medium cold storage life, and it is recommended that only hard varieties such as Granny Smith and Dunn's be stored. Whilst many varieties will store for different periods, it must be remembered by the grower that it is unprofitable to store any variety that shows waste on removal from the cold chambers. Consideration must also be given to the fact that it is not only necessary to store fruit for a period, but the fruit must be capable of keeping in good condition after removal from storage long enough for distribution and consumption. Inspection of stored apples has shown that immaturity is the greatest fault. Seasonal variations prevent any definite dates for harvesting being fixed. It would appear that cold-storing Granny Smiths picked before the fourth week and Dunn's before the second week in March gives a risk of the fruit being immature. Jonathans from the Granite Belt, it would appear, have only a short storage life, developing waste in storage after June to an extent that makes them unprofitable. Delicious have a slightly longer storage life. Where storage is carried out I would recommend the following system of inspection to be rigidly adhered to —April and May, twenty-one-day inspections; June-July, fourteen-day inspections; August-September, weekly inspections. Storage after September begins to show a much higher percentage of waste. In the Southern States the most satisfactory system of storage is by a chain of local co-operative stores where the fruit is placed unwrapped into storage in cases and packed out for market as required. As this system of co-operative local cold stores does not prevail in Queensland, growers of necessity pack their fruit before storing so that greatest advantage can be taken of the space paid for. This system has the disadvantage of making it hard to eliminate the waste, especially when only, as in successful storage, a small percentage of waste develops. Buyers take advantage of this waste, if not removed, to offer lower prices. It is advisable, to control Scald, to use oil wraps, particularly for Granny Smiths. A storage experiment conducted over a period of a whole harvesting season showed the following results in Scald control:—

Sulphite Paper Wraps	29·8 per cent. affected
Unwrapped	21·5 per cent. affected
Oiled Wraps	13·5 per cent. affected

Fruit sprayed with White Oil one week before storage developed very little Scald.

Sweating.

	Per cent. affected.
Unsweated	31·8
Sweated fourteen days	14·6
Sweated twenty-eight days	10·5

Weather conditions had an effect on the harvesting period experiments, which did not give any definite indication of procedure, but as previously mentioned in the control of Bitter Pit it is absolutely imperative that fruit be matured before storing. The experiment has showed that

wrapping fruit for transit and storage assists in eliminating case bruising. Where fruit is stored unwrapped the addition of oiled shredded paper placed amongst the fruit will give a measure of scald control.

The main essentials of successful storage are as follows:—

(1) Select only sound fruit with unbroken skins and stalks intact.
(2) Store only fully matured apples.
(3) Handle carefully during all operations.
(4) Use oiled wraps on all varieties of apples susceptible to storage scald.
(5) See that inspections are made periodically.
(6) Remove fruit from storage, and market if signs of storage troubles develop.
(7) Do not attempt to store fruit for too long a period.

In conclusion, some notes on marketing will possibly not be amiss. The keynote of successful marketing is sending regular consignments of graded fruit to the same centre. Buyers soon learn to ask for graded lines of fruit, hence the reason for regular weekly consignments to enable one's brand to always be procurable. Careful grading of first and second quality fruit is necessary to keep and secure goodwill. Consignments of mixed first and second quality are always paid for on the basis of the lowest quality in the case, a basis that usually is unsatisfactory to all parties—grower, agent, and consumer. The consumer is the one to be satisfied. Satisfaction to the consumer should ensure satisfaction to the grower and agent per medium of better prices. A sufficiently supplied market of good fruit will always return better and more profitable prices than an over-supplied market glutted possibly through the small percentage of poor quality fruit. To secure satisfactory and profitable conditions for all, it is necessary that all strive to give the maximum of quality coupled with the maximum of efficiency in get-up and handling. It is only by doing this that the apple industry will prosper and become one of the great assets to the country that are necessary for us to hold our rightful place amongst the leading countries of the world.

(TO BE CONTINUED.)

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Packing-house Management.

By J. H. GREGORY, Instructor in Fruit Packing.*

THIS is a subject that to many growers of fruit appears to be of little importance. Generally speaking, the importance of clean packing-houses is not as fully appreciated as it might be. It is not generally realised by agents handling fruit that a lot of the rots or fungi affecting fruit whilst stored in the market sections could be greatly minimised if more care was taken on the section. As in the packing shed, so in the market section, much fruit is affected by coming in contact with the spores from what has been left behind of decayed fruit impregnating the floors, &c., of the section. This infection of the fruit generally takes place through portions of fruit that have been damaged during handling whilst in transit to the markets.

Retail storerooms also could be treated with advantage to the buyer. Our first consideration in the operation of a good packing shed should be the layout and equipment. This can be done in such a manner as will enable the methods advised in the following remarks to be carried out with a minimum of time and labour.

The most economical and time-saving way of laying out a packing shed is in such a way that the work will progress from one side to the other without hindrance. This is achieved by receiving the fruit at one side of the building, placing it on the sizing machine or grading table, packing it, and delivering it to the wagons at the other side. Growers with small sheds can use a modification of this system. It must be always borne in mind that it is impossible to efficiently conduct or keep hygienically clean any packing shed, private or otherwise, unless a systematic method of working is adopted. It should be easily understandable that inefficiency and slowness of handling must materially increase the amount of breakdown and waste in fruit, with a higher risk of infection to following consignments.

Machinery is now becoming more generally used throughout the fruit industry. Sizers, washing and drying machines are increasing in number every week. Machinery of any description should be so placed in the shed that it is easy to attend and keep clean. Care must be taken to have all things, such as nails, splinters, sharp corners, &c., effectively padded, smoothed off, or covered to eliminate all chances of damage to fruit. The same should be done with orchard boxes and picking utensils. A periodical treatment of these utensils will greatly assist in eliminating the risks of decay during transit, as the source of infection is greatly reduced. A 1 in 20 solution of formalin and water is quite an effective spray for the machinery, walls, and floors of packing-houses. Walls can be sprayed at lengthy intervals, floors monthly, and sizing machines and brushers weekly. Remember, prevention is better than cure!

While this talk has a general application to all packing sheds, growers of various kinds of fruits will find different difficulties to contend with in their packing sheds and storerooms.

With citrus fruits we find that the most common storage and transport development is the so-called blue mould. This common name is

* In a radio address from Stations 4QG (Brisbane) and 4RK (Rockhampton).

not altogether correct, as actually there are two distinct moulds that appear under the common name. They are, giving the common names, blue contact mould and common green. They differ in the following characteristics:—

Blue Contact Mould.—Blue forming on the surface and also inside the fruit. Wrapping paper not readily adhering to the fruit.

Green Mould.—Olive green forming on surface only. Wrapper adheres closely to the rotting fruit. This is the most prevalent of the two moulds.

As the green mould depends mostly on skin injuries for its means of infecting fruit, it can readily be seen how necessary it is to eliminate all sources of skin injury, such as nails, screws, splinters on sizing machines, &c.

Blue contact mould, as the name suggests, will spread by infected fruit coming into contact with other fruit. From this will readily be seen the need for destroying all infected fruit as soon as possible. How often do we see cases of waste citrus fruits left in odd corners of the packing sheds? Where fruit is sweated for periods and odd specimens become infected, care should be taken to keep these specimens from going on to sizing machines, as they will leave spores on the machinery to infect other fruit as it travels through the machine. It is not my intention to deal at length with all the storage and transit rots which careful methods of handling should practically eliminate. Spraying the machine with a 1 in 20 solution of formalin weekly, coupled with the periodical shed treatment as previously mentioned, is recommended. Orchard picking boxes, if used, should be dipped occasionally in a 1 to 100 solution of lime sulphur.

Tomatoes.

Irish blight, as it develops to a large extent in the field, is one of the worst troubles we have to contend with. Keep the sheds and plantations clear of all infected fruit, which should be carefully destroyed. Use separate picking containers to gather infected specimens. Do not use second-hand cases. Spray packing and sorting tables weekly.

Stone Fruits.

Brown rot is by far the worst trouble encountered whilst handling any fruit, its effect being so rapid. I have seen apparently sound fruit packed, and three hours after the fruit was unsaleable. Coupled with adequate field measures, the same control as used for Irish blight should prove effective. It must be remembered that the use of second-hand cases plays a large part in transmitting these diseases from one place to another. Where picking boxes are used, a periodical dipping in a 1 to 100 solution of lime sulphur is of great assistance. Care must be taken during handling to eliminate skin injuries, as these are often the first source of infection. Other transit rots are also caused by bruising and bad handling.

Apples and Pears.

Rots of the more virulent type do not trouble these fruits to the same extent as citrus and stone fruits. Careful handling all the time to avoid skin damage is giving very successful results. Where fruit is stored in the shed for a period of weeks, the walls and floors should be first treated with formalin. Skin damage is the usual cause of decay

starting in these fruits. It is usual for the bottom cases of stacked fruit to show a higher percentage of waste, due possibly to neglecting to treat the floors before stacking.

Packing sheds are also the means frequently of increasing the infection of an orchard by codling moth. Care should be taken to thoroughly examine all buildings and equipment for this pest, which uses cracks and corners in which to over-winter. Treatment with hot water will be of assistance. All orchard cases can easily be dipped in a tub of hot water at the end of the season.

While there are many more diseases one could mention, it will be found that the treatments recommended for the most general troubles will, as a rule, prove satisfactory in controlling our other transit and storage rots.

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Dairy Fodder Plots.

By A. E. GIBSON, Director of Agriculture, and C. S. CLYDESDALE, Senior Instructor in Agriculture.

The subjoined notes are reprinted in response to numerous requests from readers in several districts in the State. They are of particular interest and value at the present time.—ED.

THE majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimbah Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the summer months.

No fertilizers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

Plate 37.—Prince Wheat and Vetches at Mr. A. Hulse's Farm, Yandina.

Plate 38.—Prince Wheat and Vetches at Mr. F. E. Burton's Farm, Bridges, N. C. Line.

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487 ..	13
April	453 ..	13
May	213 ..	11
June	792 ..	9
July	652 ..	6
August	31 ..	2
September	205 ..	12

Cultivation.

At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and later on, in March, was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

The plot at Nindooimbah was fallowed during the summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.

The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disked" in, the cereals being sown on the disked surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early-maturing varieties.

Description and Varieties on North Coast.

The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 feet in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 feet at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 feet high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 feet in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 feet in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 feet 6 inches in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 feet in height.

Plots at Nindooimbah.

Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

[The varieties of wheat mentioned in the foregoing (Prince and Patriot) are now somewhat difficult, if not impossible, to obtain, but Warren and Warchief—two well-known wheats at present in use throughout the wheat-growing areas of Queensland—may with confidence be recommended as substitutes.

Similarly, Sunrise oats may be substituted for Ruakura, a variety of oats not always readily obtainable.]

Skinless and Cape Barley.

During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

Ruakura and Algerian Oats.

The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.

Owing to its early-maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 feet in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.

Barley was sown at the rate of 50 lb. per acre.

Oats were sown at the rate of 40 lb. per acre.

Rye was sown at the rate of 60 lb. per acre.

Field peas were sown at the rate of 30 lb. per acre.

Vetches were sown at the rate of 20 lb. per acre.

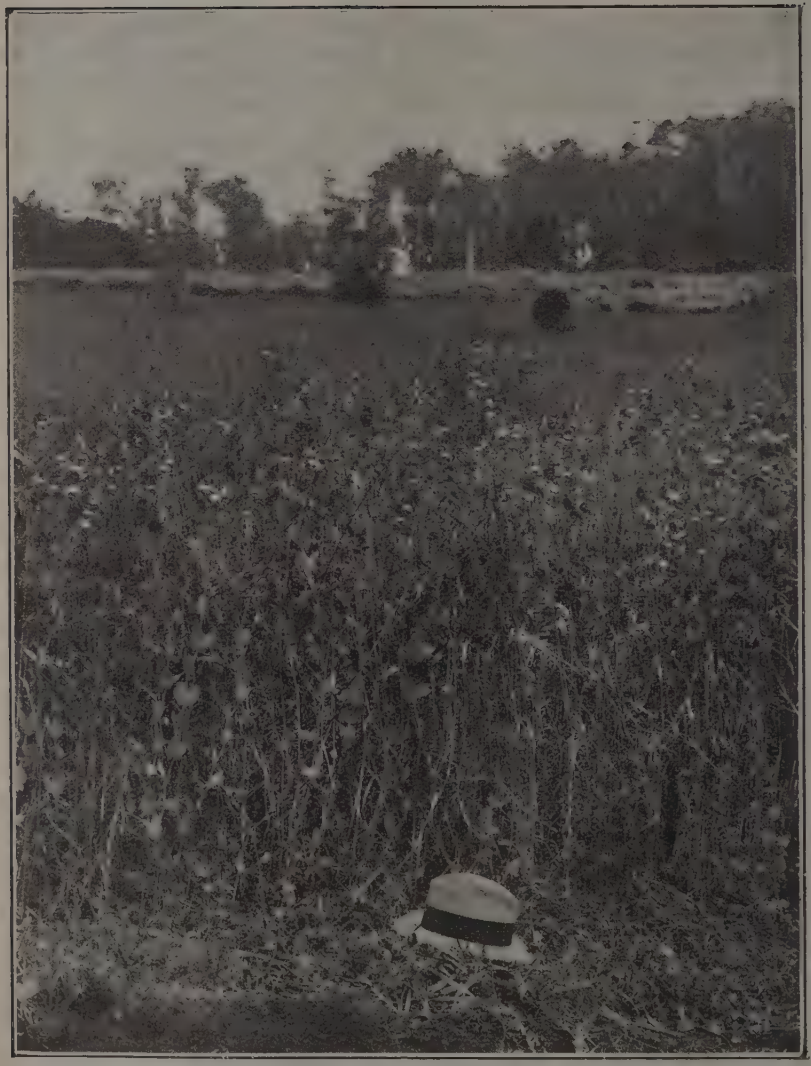

PLATE 39.—PATRIOT WHEAT AND FIELD PEAS AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

PLATE 40.—KUDZU VINE (FODDER PLANT) ON A FARM NEAR BRISBANE.

RESULTS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stephens, Nindooimbah.			
	T.	C.	Q.	LB.	T.	C.	Q.	LB.	T.	C.	Q.	LB.
Prince wheat and peas	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas	12	3	0	9	10	16	0	8	13 (two cuttings)	10	0	10
Cape barley and vetches	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

PLOTS AT TOOGOOLAWAH.

For some years the Department of Agriculture has endeavoured to interest dairymen and stockowners generally in the matter of fodder provision for their herds during those periods when, by reason of the lack of succulence in the natural pastures, yields from their herds have been considerably lessened, and, in some cases, even reduced within measurable distance of vanishing point.

The practice of arranging with interested farmers to carry out trials designed and supervised by officers of the Department, has met with a good deal of success. The results to date have clearly shown that by early and careful preparation heavy returns are readily available of rich, succulent, milk-producing fodders, and that a continuity of this class of food can in normal seasons be kept up to tide milch cows over periods during which their productivity is affected by the gradual depression, induced in each animal's system, by being called upon to make use of rough grasses of low nutritive value, at a time when weather conditions were at their worst.

Ocular evidence has shown that improved milk supplies and a correspondingly improved return from the factory is inducement enough for other neighbouring farmers to profit by the example of the one who first adopted the system of growing crops regularly, for his dairy stock —actually, on a farm, an inexpensive method of maintaining an income.

In the present crop trials carried out on Mr. T. Coleman's property at Toogoolawah, no fertilizers of any kind were used. The plots were situated on well-prepared alluvial soil near Cressbrook Creek, which had been under cultivation for a number of years.

The plots were sown on 31st March, 1925, and were harvested for yield-computing purposes on 30th July, 1925; consequently, each yield submitted represents four months' growth of fodder, and judged on this basis may be considered as highly satisfactory.

A more vigorous growth was noticeable in the case of Florence wheat and peas or tares and the Skinless barley with a similar mixture, both of which were well out in ear and rapidly maturing; rye had made a dense growth in both instances, but only a few heads were to be seen, and probably a further three or four weeks would be required to bring it to a similar state of maturity to that obtained by the Florence wheat at date of harvesting. The following yields were recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Florence wheat and peas	7	14	1	4
Cape barley and peas	9	11	1	0
Skinless barley and peas	10	15	1	0
Rye and peas	8	10	1	12
Algerian oats and peas	8	3	3	20
Canary seed and peas	11	8	0	24
Florence wheat and tares	7	4	2	16
Cape barley and tares	9	0	0	0
Skinless barley and tares	11	1	3	4
Rye and tares	12	13	3	20
Algerian oats and tares	10	15	1	12
Canary seed and tares	8	10	1	12

Plate 41.

Florence Wheat and Tares. Yield—7 tons 4 cwt. 2 qr. 16 lb. per acre.

In view of the fact that some of the plots might be regarded as too immature for the purpose of obtaining the maximum yield, further

weighings for comparative purposes were made on the 24th August, with the following results:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Algerian oats and peas	11	9	3	12
Rye and peas	8	13	2	8
Canary seed and peas	7	17	2	0
Algerian oats and tares	13	19	2	6
Rye and tares	9	9	2	16
Canary seed and tares	13	14	3	8

When selecting fodders for the test, cognisance was taken of their respective periods of maturity so that a continuity in the supply of green fodder might be kept up. Obviously the grower, by using judgment in the matter of arranging for succession sowings, should readily be able to maintain his supplies, and in this way ensure a more regular state of productivity in his herd.

PLATE 42.

FLORENCE WHEAT AND DUN FIELD PEAS. Yield—7 tons 14 cwt. 1 qr. 4 lb. per acre.

Observations made respecting the period of development of the different crops were as follows:—Florence wheat and Dun field peas were ready for use earlier than any other single crop or combination, followed by crops in the order named: Florence wheat and tares, Skinless barley and peas, Cape barley and peas, Skinless barley and tares, Cape barley and tares, Rye and peas, Rye and tares, Algerian oats and peas, Algerian barley and tares, Canary seed and peas, Canary seed and tares.

Observations made indicate that it is advisable when arranging for mixtures of crops to confine the sowing of peas to the early-maturing cereals—Florence wheat, Skinless and Cape barley—as the peas begin to lose weight as they approach maturity. Tares, on the other hand, have a longer growing period and retain their succulence better than the field peas; consequently, they are more suitable for use with Algerian oats, Canary seed, and Rye.

To those dairymen who are interested in maintaining supplies to their respective factories throughout the winter period, the following quantities are recommended for use in connection with the above class of fodders:—

Wheat 30 lb., Dun field peas or Black Tares 20 lb.
Barley 40 lb., Dun field peas or Black Tares 20 lb.
Rye 30 lb., Dun field peas or Black Tares 20 lb.
Oats 30 lb., Dun field peas or Black Tares 20 lb.
Canary seed 10 lb., Dun field peas or Black Tares 20 lb.

Plate 43.
Cape Barley (in short blade stage) and Dun Field Peas.
Yield—9 tons 11 cwt. 1 qr. per acre.

DRY SEASONS—A COUNTERING FIELD CAMPAIGN.

The loss of national wealth to this State brought about by periods of drought cannot be accurately estimated by figures—but their effects

PLATE 44.—PEAS AND PILOT WHEAT ON MR. F. W. THIEDEKE'S FARM AT BEAUDESERT.
Weight 10 tons 17 cwt. 2 qr. 19 lb. per acre.

PLATE 45.—PEAS AND FLORIDA WHEAT ON MR. F. W. THIEDEKE'S FARM AT BEAUDESERT.
Weight—11 tons 17 cwt. 2 qr. 20 lb. per acre.

Plate 46.—Pilot Wheat and Peas at P. Caswell's, Wangalpong (Fodder Plots).

are undoubtedly far-reaching. If action can be taken over certain areas whereby increased production can be brought about, it naturally follows that dry periods are robbed to some extent of their devastating influences and the loss to the State as a whole is decreased. A policy of this kind is naturally educative in its character to all, but when certain sections are dealt with it becomes more particularly of value to those directly interested, and this is increased when illustrations are given for the purpose of proving the policy advocated.

Plate 47.—Florida Wheat and Vetches at P. Caswell's, Wangalpong (Fodder Plots).

For some time past the Department of Agriculture and Stock has interested itself in increased production of dairy and allied products, and with this object in view has initiated a series of fodder trials in various districts for the purpose of pointing out that if means are adopted for the annual provision of fodder crops for dairy stock and pig raising, the fluctuations which have in the past taken place in the supply of these products will be considerably reduced if not entirely removed.

During the past few months the losses to dairymen and others, brought about by lessened production resultant of the dry period experienced, amounts to a considerable value, and attention is drawn to the fact that these can be considerably reduced by adopting the policy of careful soil preparation and the sowing of crops calculated to fill the void caused by the absence or decreased supplies of natural grasses and herbage.

It was with such an object that dairy and pig fodder trials were established on the farms of Messrs. F. W. Thiedeke and Peel Caswell, of Beaudesert and Wangalpong respectively, and results obtained so far from portions of these plots have proved the soundness of the principle involved. Both farmers are capable agriculturists, whose methods of cultivation leave little to be desired, and who are fully seized of the importance of fallowing and thoroughly preparing their land prior to seeding operations. The results obtained on the comparatively low rainfall experienced at Wangalpong speak for themselves; and whilst the soil at Beaudesert is of a heavier nature than that met with in parts of the Canungra Valley, the heavier rainfall experienced more than compensated for the difference in soils and their moisture-retaining qualities.

The plots were planted on the 9th and 10th June at Mr. Thiedeke's at Beaudesert whilst those at Mr. Caswell's at Wangalpong, were planted on the 12th and 14th of June, rainfall experienced between the 9th June and 23rd September (the date of harvesting) at Mr. Thiedeke's being 3·66 inches, but it must be noted that a fall of 1·06 inches was experienced on 7th June, two days prior to planting. At Mr. Caswell's the rainfall received between the 12th June and 24th September totalled ·91, the previous rains to that date being 1·25 inches, registered on 14th and 17th May.

The following weights of green fodder were recorded:—

	Mr. F. W. Thiedeke, Beaudesert.				Mr. P. Caswell, Wangalpong.			
	Tons.	cwt.	qr.	lb.	Tons	cwt.	qr.	lb.
Florida wheat and peas ..	11	17	2	20	7	6	1	22
Florida wheat and tares ..	10	8	3	13	7	4	0	5
Pilot wheat and peas ..	10	13	2	19	8	5	2	17
Pilot wheat and tares ..	10	4	0	7	6	12	0	5
Skinless barley and peas ..	11	8	0	8	6	4	3	10
Skinless barley and tares ..	4	16	0	3	7	1	2	16
Cape barley and peas ..	6	2	1	21	4	18	1	20
Cape barley and tares ..	9	7	1	1	4	16	0	3
Rye and peas	5	15	0	27	4	16	1	20
Rye and tares	8	0	3	11	3	7	0	25

The varieties of wheats used in the trials were Pilot, a Bunge-Florence crossbred, and Florida, a Bobs-Florence crossbred, both of which were raised at Roma State Farm. These varieties made excellent

growth, and were remarkably even throughout the trials. At the time of harvesting both varieties were in the flowering stage, averaging 3 feet 6 inches in height.

At Wangalpong both Pilot and Florida showed signs of flag-rust, but at Beaudesert no signs of rust were apparent. This was probably due to local conditions and to the fact that humidity in the Canungra Valley is greater than in the more open areas around Beaudesert.

Cape Barley.—This crop made fair growth and when harvested was in the shot-blade stage—the height averaging 1 foot 9 inches of good healthy growth. From the general appearance of the crop a later cutting will give a heavier yield.

Skinless Barley was a clean and attractive crop, averaging 3 feet in height, which had made a remarkable growth of foliage. When harvested the grain was in the soft dough stage.

Rye.—In each case this crop made rapid growth, and was in the flowering stage when harvested, averaging 3 feet in height. Generally speaking, growth was somewhat on the thin side, and heavier quantities of this cereal should be sown when the season is somewhat advanced, as it was in this particular instance.

Field Peas in all plots made fair average growth of 1 foot 6 inches in height. When harvested they showed signs of wilting, thus reducing the weight per acre that under other conditions would have been recorded.

Vetches, usually rather slow in maturing when compared with peas, made favourable growth.

The pig fodder plots were not sufficiently far advanced in growth on 23rd September to justify their harvesting; consequently, this matter was deferred till 24th November, but during this period a further rainfall of 326 points was received and recorded as follows:—25th September, 32 points; 28th September, 166 points; 16th October, 46 points; 25th October, 9 points; 16th November, 73 points; total, 326 points.

As a result increased growth was in evidence compared with that shown on the occasion of the previous visit.

As in the case with the dairy plots, Mr. Caswell had given careful attention to the cultivation of the various fodders, and an entire absence of weed growths was noticeable.

The various yields recorded can be regarded as valuable illustrations of what can be accomplished by careful and systematic cultivation of crops that are suited for purposes of economic pig-feeding and can be produced at little cost to the grower.

The following are the yields recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Thousand Headed kale	11	15	3	3
Dwarf Essex rape	6	9	2	16
Yellow Glode mangles	29	8	1	20
Long Red mangles	23	19	2	12
Purple Top Swede turnips	14	18	0	27
Elephant Swede turnips	12	13	3	18
Sugar beet	17	6	2	12
White Belgian carrots	12	13	3	18

The Dwarf Essex rape suffered somewhat from the attacks of Aphis, whilst the foliage of the Swede turnip was subjected to the attentions of the Rutherglen Bug; otherwise the crops were excellent in every respect.

Economic Geography of Sugar.

By C. V. HIVES, B.A.

The following is the full text of an address delivered by Mr. C. V. Hives, of "The Australian Sugar Journal," under the auspices of the Educational Broadcasting Committee of Queensland, being one of a series of lectures on the Geography of some Important Primary Products; and broadcast from Stations 4QG (Brisbane) and 4RK (Rockhampton).

THE two chief sources of raw sugar are the sugar-cane and the sugar-beet. The world produces some 25 million tons of sugar per annum, two-thirds of which is derived from sugar-cane and one-third from sugar-beet. The refined sugar of commerce made from either of these two sources is precisely the same commodity, though it is marketed in various forms, such as lump sugar, granulated, and so forth. The sugar-cane has been known since time immemorial, and to-day is cultivated within a climatic range covering both tropical and sub-tropical regions. Botanically it is a gigantic grass resembling a bamboo and well known to most Queenslanders. The sugar-beet is a sweet root of the same species as the ordinary garden beet-root, but it is white, not red. It is grown for sugar production in most European countries, including Russia, and in parts of the United States of America. A glance at the map of the world will show that the 50th parallel of latitude in the northern hemisphere runs through the beet belt in both Europe and North America.

Sugar, in one form or the other, is now being produced in at least sixty different countries. An exhaustive study of the subject would entail a survey of mankind, literally, from China to Peru. The mere geography, including climatic factors, is comparatively a simple matter to explain. The important factors which have determined the present distribution of sugar production throughout the world are political, historic, and economic. In the production of sugar national policies have always played a particularly important part, more important than in the case of any other primary product. This is a fact that must always be borne in mind in any study of sugar as a world commodity.

A convenient way of approaching the subject, perhaps, is to outline the rivalry that has prevailed for the last century and more, and is still prominent to-day, between cane-sugar and beet-sugar. Here we have the interesting feature of direct competition between the agricultural production of tropical and temperate zones. The commercial commodity itself is identical, but produced from two very dissimilar plants growing respectively under two very different sets of geographical conditions. Cane-sugar might be described, not inaccurately, as crystallised sunlight, and the tropical zone with its hot, moist weather is the natural home for its production. In the case of beet, the bright light of direct sunlight is not necessary for sugar formation, the diffused light from a cloudy sky being found to be suitable. This has been demonstrated in recent years by experience in Great Britain. This double origin of sugar—from the tropical and temperate zones—means that the area of supply is very widely distributed. Fluctuations of world production due to climatic factors alone are therefore relatively small.

The potential and actual yield of sugar from cane is considerably higher than from beet. Beet-sugar, however, has always owed both its development and its maintenance to tariffs and subsidies which have enabled it to withstand the competition of the tropical product. It is true that in recent years cane-sugar has also been fostered in some countries, so much so that probably three-quarters of the world's total output of sugar to-day receives some form of protection or preference. There is little doubt that were all forms of production to be withdrawn, the production of beet-sugar would shrink to very small dimensions and in many countries would disappear altogether. Sugar-beet, however, is an important rotation crop, and its position in European agriculture is further strengthened by the value of its by-products in the feeding of livestock.

Historical Review.

The establishment of the beet-sugar industry was really due to Napoleon. As part of his campaign against England, he declared an embargo against any merchandise entering the Continent from England or her colonies. America and the West Indies were then the chief sources of sugar, and Napoleon thus cut off supplies from Europe. He then set aside large tracts of land for beet-raising and compelled the peasant farmers to cultivate beets. Great difficulty, however, was experienced in the first attempts to manufacture sugar from this new source. It was only the power exercised by Napoleon and his determination to outdo the English that brought this new industry into existence. In the end Great Britain reigned supreme at sea, and on the downfall of Napoleon in 1815 the ports of Europe were thrown open to cheap cane-sugar from the Colonies. The newly-established beet industry which had spread over Germany, France, and Austria, was unable to hold its own, but the various Governments concerned came to the rescue and fostered it in every possible way. Then the cane-sugar industry suffered a severe setback owing to the abolition of slavery in most of the European colonies. Twenty or thirty years elapsed before the planters became accustomed to the new state of affairs. This transition period coincided with the artificial extension of the beet industry, which was encouraged and supported by bounties and privileges of all kinds. The production of cane-sugar remained almost stationary, but the beet-sugar industry in Europe gradually increased so that at the end of the last century it accounted for nearly two-thirds of the world's total sugar supply.

Sugar, and its chief by-product, rum, played an important part in the early history of the last century. "In their tropical climate," says one writer, "the West Indian planters had learn to distil from the sugar-cane the most warming and comforting spirit for a damp and capricious climate that Nature could devise." Rum, for more than two centuries, has been a naval ration, the allowance to an ordinary seaman at one time being half a pint a day. Nelson's body was brought home from Trafalgar preserved in the only cask of rum left on board the "Victory." The battered remnant of the crew were obliged to "broach the Admiral" on the way home to save their own lives. "Draw on, my heartiest!" says the shade of Nelson in "The Dynasts," "better I shrivel than you famish!" Rum, in fact, according to another writer, was a foundation of British sea-power. At any rate, British sea-power at that time undoubtedly determined to a large extent the future trend of sugar production throughout the world at large. The history of sugar and its chief by-product is a picturesque one. Rum was the

currency of the slave-trade, which in turn was the backbone of the sugar industry. It was also the currency of the Colony of New South Wales for some years. The West Indian Islands loomed large on the map of those days.

Coming to more recent times, we find at the outbreak of the Great War that world sugar production had increased to 18 million tons, of which the tropics were supplying a little more than one-half. Of the total world consumption, however, about four-fifths is accounted for in temperate lands. The big consumers are countries like the United States of America, the United Kingdom, Germany, and France. The War caused a great decline in the production of Europe, including Russia, not only by the fact that military operations were carried out over the actual sugar-beet areas, but still more through the general disorganisation of the Continent. By 1920 cane-sugar was supplying 80 per cent. of the total world consumption, and the tropics reaped a rich harvest at the expense of Europe. The world price of sugar soared and a great expansion of the industry took place in countries like Cuba and Java.

Gradually the European beet industry recovered, and the proportions of cane-sugar and beet-sugar, as previously mentioned, are now respectively two-thirds and one-third. This revival in Europe coincided with the coming into full production of new plantations in the tropics which had been stimulated by the war price of sugar. The result has been serious over-production, leading to an unprecedented depression in world sugar prices.

Sugar's Present Position.

We can now survey more closely the position as it is to-day in various parts of the world.

Starting with Europe, we find some fifteen different countries producing beet-sugar in quantities more or less sufficient for their own needs. Chief amongst these are France, Germany, and Czechoslovakia.

The position in Great Britain requires special consideration. Her consumption is over two million tons of sugar per annum, an increasing proportion of which is now being derived from her own beet industry. This industry has been gradually established only during the last ten years or so, but annual production now approximates half-a-million tons. The cost to the British Treasury, however, represents some £6 millions per annum. It is a remarkable example of the trend in Britain towards self-sufficiency as regards food production, irrespective of purely economic considerations. The general policy of Great Britain with regard to sugar affords also an interesting example of how the normal flow of commerce may be completely changed by tariffs and other similar measures. Twenty years ago she was importing the whole of the two million tons she required, 80 per cent. of which was beet-sugar from the Continent. To-day she is providing 25 per cent. of her requirements within her own borders. Nearly 40 per cent. of the imported sugar (representing three-quarters of a million tons) is derived from Empire sources, Australia and South Africa and the Crown Colonies of Mauritius, the West Indies and British Guiana all contributing their share. The balance is obtained from tropical countries such as Cuba and Peru.

This diversion of supplies has been effected through a tariff designed to exclude refined sugar and at the same time to encourage the importation of raw cane-sugar from Empire sources. It should be mentioned

here that Great Britain's total imports of sugar are still actually two million tons, but she now re-exports about 400,000 tons in the form of refined sugar. The various sources of her supply of this commodity and her general policy in relation thereto afford a most interesting lesson in economic geography, international trade, and the effects of tariff policies.

As to future developments, in the European beet countries the principal areas of production are already fully exploited. The greatest potentialities in the beet zone are within the vast area covered by the Soviet Union of Russia. Production in a normal year under present conditions would be about one and a-half million tons of sugar, leaving some for export. According to the second five-year plan, production is to reach seven million tons by 1937. This may appear excessive, but it should be remembered that the main objective of the first five-year plan was to develop a highly industrialised economy. Everything, including agriculture, was sacrificed to this. In the future, we may expect to see more attention given to the agricultural resources of the country, including the beet-sugar industry. There is apparently an almost unlimited area of land available for beet cultivation. A recent official report, for example, states that new sugar factories are under construction in Central Asia and in Southern Siberia. This serves to remind us that the area covered by the U.S.S.R. is equal to that of the whole British Empire. The population is at least 150 millions, increasing at the rate of two millions per annum, and the present level of consumption per capita is very low.

We next turn our attention to the United States of America, including those islands which are under her jurisdiction. Normal consumption within the United States of America is six million tons per annum. Like Great Britain, she obtains about one-fourth of her requirements from her own domestic beet industry, supplemented, however, by a certain amount of cane-sugar produced by the Southern States of the Union. The balance, all in the form of cane-sugar, is imported from Cuba and from her oversea possessions, the island of Puerto Rico, the Hawaiian Islands, and the Philippine Islands. The United States of America in the past has indulged in an expansionist policy and, like Great Britain, she has commercial Empire problems of her own. These are concerned very largely with the sugar industry. The problem of the Philippines affords good illustration of this. These islands formerly belonged to Spain, and following on their acquisition by the United States of America, a great expansion took place in the production of sugar, which had become entitled to the right of free entry into the States. This expansion was not favourably regarded by opposition sugar interests in the United States of America, who used all their influence to further the movement for granting independence to the Filipinos. This is now due to take place in ten years' time, when the right of free entry into the United States of America will be finally withdrawn. Philippine sugar will then have to face the open competition of the world's market. An economic reaction seems inevitable which may have far-reaching effects in the political sphere. These islands have been owned by two different nations within the last generation. They are by no means fully exploited and they lie midway in the direct route between Japan and Northern Australia. Japan, it may be mentioned here, obtains most of her sugar from Formosa, an island in the China Sea, which is part of the Japanese Empire. The Empire in this respect now approaches self-sufficiency.

If we follow the tropic zone round the globe, starting with the Philippines, we find that these islands, together with Java, Australia, Hawaii, Cuba, Santa Domingo, Puerto Rico, the West Indies, Peru, and Mauritius, are the principal exporters of sugar. It will be noticed that nearly all these places are islands. The most suitable climate for sugar-cane is one where hot moist weather alternates with periods of hot dry weather. It is very much at home, therefore, in mountainous islands inside the tropics. Of the total world production of cane-sugar 70 per cent. is produced within the tropic zone. Until quite recently Cuba was the outstanding producer of sugar in the whole world, production in that country having reached five million tons in 1929. Great as are its advantages in soil and climate, it was proximity to the United States of America and a favourable tariff with that country that allowed Cuba to develop its natural resources to the full. As production within the tariff wall of the United States of America (including the island possessions) increased, the market for Cuban sugar contracted. The price fell to below cost of production. A scheme for international limitation of production was initiated, but this proved a failure. Then followed a series of political revolutions, the net result of all this being that Cuban production of sugar dropped last year to only two million tons.

Java was, until recently, the next largest producer with three million tons. The industry here is a model of organisation, efficiency, and scientific research, for which the Dutch are responsible. Formerly, all the sugar produced was exported to the Netherlands for refining. With the abolition of tariff preference, this market was lost. For a time Great Britain and the United States of America took the place of the mother country. These markets in turn were lost owing to the trade policies of these two countries. For many years past Java has had to rely mainly on the markets in India, China, and Japan, but recently the growth of protective barriers in the East has jeopardised her market in this quarter of the globe. Last year her production of sugar was little more than half-a-million tons. All the natural geographic advantages possessed by Java and all her efficiency have proved unavailing against the new tariff of India and the developments arising therefrom.

India is the great continental sugar-cane country, the crop being grown chiefly in sub-tropical areas in small plots by peasant cultivators. Methods in agriculture are crude, but a great expansion has taken place during the last two years. Under the shelter of a new protective tariff, modern factories are springing up everywhere. Imports of sugar, formerly one million tons per annum, chiefly from Java, are rapidly approaching vanishing point. India now heads the list of all sugar-producing countries and with a very low cost of production and efficient management she may yet enter the export market.

This completes our brief survey of the sugar world. We started with Europe, crossed to America, traversed the tropics, and ended with India. In dealing with Europe, we touched on the projected extension of the beet industry into Central Asia. This area, it will be noticed, is not far distant on the map from Northern India, so we have thus completed the circle of the globe.

Summary.

Summarising the position with regard to these various countries, we find that India, owing to the decline in the size of the Cuban crop, now

holds the leading position amongst sugar producers. In the production of beet-sugar, the U.S.S.R. has by far the greatest potentialities. Neither India nor Russia, however, is in a position at present to export. If that stage should ever be reached by both these countries, a new and interesting phase of the rivalry between beet-sugar and cane-sugar may be looked for. The production of India is based on individual peasant economy, backed largely by British capital and British technique in the factory. The production of Soviet Russia is on a collectivist basis with mechanisation applied to the field. Mass production in agriculture, in fact, is contemplated. All this, however, is a matter of speculation, and lies somewhat outside the realm of statistics and economic geography.

So far as the other principal countries are concerned, the following summary represents some of the recent trends in production during the last five years. The output of Cuba and Java taken together has declined by over 60 per cent., while that of India has increased by more than 60 per cent. Production of sugars within the United States of America, including its overseas territories, has increased by 50 per cent. Similarly, the increase within the British Empire, taken as a whole, but exclusive of India, amounts to 30 per cent. The production of beet-sugar throughout Europe generally has declined by 20 per cent. The position of Cuba and Java emphasises the fate that to-day awaits an export country which lives in economic isolation. It is countries which live within protected groups, such as the British Empire or the United States of America, that have been able to expand production. Recently, within these two groups competition for the market of the motherland, as between members of each group, has become manifest. Both Great Britain and the United States of America are now faced with the problem of allocating quotas amongst the various members of their respective families. The flow and direction of international trade increasingly depends upon such things as commercial treaties, preferences, and import quotas.

Australia.

Finally there remains Australia to be considered. Here we have a series of widely separated cane districts stretching from latitude 17 deg. in Queensland to the 30th parallel in New South Wales. The industry originally started in sub-tropical areas, but as the Northern districts became more accessible, it gravitated naturally to the tropics. About 85 per cent. of the total Australian production of sugar is now within the tropic zone. To show the climatic range in Australia, it may be mentioned that beet-sugar to a small extent is being produced at Maffra in Victoria. Incidentally, this appears to be the only beet-sugar produced in the Southern hemisphere.

As in many other countries, the industry here is protected on national grounds, but these grounds have a special validity in the case of Australia. As the present Prime Minister recently stated, the people willingly subscribe to the cost of the sugar industry, because they believe in the White Australia policy. They do so on particular national grounds because on the coastal margin of North Queensland it it sugar or nothing. Under this policy the industry has expanded to a remarkable degree. A considerable export trade has been built up with the mother country under a preferential tariff designed to encourage the production of sugar within the Empire. Production is now over 600,000 tons per annum. Australia, in fact, is to-day the largest producer of

sugar within the British Empire, except only India. A similar development of the industry has been noted in the various overseas possessions of the United States of America.

A feature that has been generally overlooked is the tendency of Australia towards imperial expansion on its own account. The Australians are an enterprising race with a genius for putting names on the map. Not content with their own vast continent, they have explored Antarctica and acquired Papua. Their energies range from the Equator to the South Pole. In this sugar has played its part. It was from New Guinea many years ago that a Queensland expedition obtained the best variety of sugar-cane then known to the world. Individual Queenslanders in recent years have successfully established the industry in Kenya, East Africa, just below the Equator, at a height of 4,000 feet above sea-level. In the South Pacific Australia has established a species of Monroe doctrine. The Fiji Islands, for instance, a British Crown Colony, are practically owned by Australia. The sugar industry is the backbone of these islands, and the industry there is an entirely Australian enterprise.

The features just mentioned are in conformity with the general history and development of most cane-sugar countries. The unique feature that distinguishes the Australian industry is that it embodies in itself a definite national policy, and this has resulted in the achievement of something that is new in the history of the world. The white races have frequently invaded the tropics, but in almost every region their penetration failed. Now we are told by Dr. Grenfell Price, a leading authority on the subject, that "to the utter astonishment of the scientists of all nations we have established a working population of 150,000 white people in North-Eastern Queensland—the largest population of working Nordics in any part of the tropics." Apart from any question of material production or economic geography, this is an achievement of which Australia in general, and Queensland in particular, can be justly proud.

STUD PIG PURCHASES.

Included among prize-winning stock from the Melbourne Centenary Show purchased by Queensland breeders of stud pigs are a pair of very fine quality Berkshire sows secured by Miss Jean Handley on behalf of the Bon Vale Stud at Murphy's Creek. The purchases include the first prize Berkshire sow in class four months old and under. This sow, "Clethorpe's Rosie" was bred by that well-known stud master, Mr. T. White, of Clethorpe, Victoria. She is a nice lengthy sow with a nice head and well developed quarters. Another sow, "Dookie Elsa," a product of the stud at Dookie Agricultural College, is sired by "Dookie Valet" (8876), and from "Dookie Disdain" (11602), both well-known families unrelated to those bred by Mr. T. White.

Other purchases were made on behalf of Mr. W. S. Hendry, of the Ascot Vale Stud, Clifton, and by Mr. Percy V. Campbell, of Lawn Hill, Lamington, Queensland, who with Mr. J. A. Heading, of Murgon, attended the Melbourne Show and Stud Pig Breeders' Society meetings as delegates from the Queensland branch of the Stud Pig Breeders' organisation. Mr. Heading also made some purchases for his Highfields Stud.

The periodical introduction of fresh breeding stock of improved type does much to assist, but there is a big field of work ahead, and it is hoped before very long a much more representative shipment of stud pigs will be secured from countries overseas, for the pig industry has developed to such an extent and is of such importance as to warrant money being spent in introducing further stock.

CROP PLANTING TABLES FOR QUEENSLAND.

NUMBER OF PLANTS REQUIRED TO PLANT AN ACRE OF GROUND AT GIVEN DISTANCES.

	Plants.		Plants.
3 in. × 12 in.	174,240	18 in. × 42 in.	8,297
6 in. × 6 in.	174,240	18 in. × 48 in.	7,260
6 in. × 9 in.	116,160	20 in. × 24 in.	13,068
6 in. × 12 in.	87,120	20 in. × 30 in.	10,454
9 in. × 9 in.	77,440	20 in. × 36 in.	8,712
9 in. × 12 in.	58,080	20 in. × 42 in.	7,467
12 in. × 12 in.	43,560	20 in. × 48 in.	6,534
12 in. × 15 in.	34,848	2 ft. × 2 ft.	10,890
12 in. × 18 in.	29,040	2 ft. × 3 ft.	7,260
12 in. × 24 in.	21,780	2 ft. × 4 ft.	5,445
12 in. × 30 in.	17,424	2 ft. 6 in. × 3 ft.	5,808
12 in. × 36 in.	14,520	3 ft. × 3 ft.	4,840
12 in. × 42 in.	12,446	3 ft. × 4 ft.	3,630
12 in. × 48 in.	10,890	3 ft. 6 in. × 3 ft.	4,148
15 in. × 18 in.	23,232	4 ft. × 5 ft.	2,178
15 in. × 24 in.	17,424	4 ft. × 6 ft.	1,815
15 in. × 30 in.	13,939	4 ft. × 8 ft.	1,361
15 in. × 36 in.	11,616	4 ft. × 10 ft.	1,089
15 in. × 42 in.	9,956	4 ft. × 12 ft.	907
15 in. × 48 in.	8,712	6 ft. × 6 ft.	1,210
18 in. × 18 in.	19,360	6 ft. × 8 ft.	907
18 in. × 24 in.	14,520	6 ft. × 10 ft.	726
18 in. × 30 in.	11,616	6 ft. × 12 ft.	605
18 in. × 36 in.	9,680		

The omission of the last figure will give the number required for 16 perches.

TABLE OF EQUIVALENT QUANTITIES OF MANURES.

Per Acre.	Per Square Perch, Approx.	Per Square Yard, Approx.
1 ton	14 lbs.	7½ ozs.
10 cwt.	7 ,,	3¾ ,,
5 ,,	3½ ,,	2 ,,
4 ,,	2¾ ,,	1½ ,,
3 ,,	2 ,,	1 ,,
2 ,,	1½ ,,	
112 lbs.—1 cwt.	11¼ ozs.	
84 ,,	8½ ,,	
56 ,,	5½ ,,	
28 ,,	2¾ ,,	

1 Dessert-spoonful equals about 1 oz.

SOUTHERN DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant.			How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
					Ft. In.	Ft. In.				
Arrowroot	Farina and pig food ..	Aug. to Oct.	..	..	5 0	2 0	Tubers or "bulbs" 10 to 12 cwt.	..	8 to 10	Suited only to coastal districts. Tropical and semi-tropical.
Artichoke (Jerusalem)	Market sale and pig food	Aug. to Oct.	Sept. to Oct.	..	3 6	1 6	4 to 5 cwt.	..	4 to 5	
Asparagus	Market sale	Aug. to Sept.	Sept.	..	4 0	1 6	7,260 roots	..	18	May also be propagated from seed sown thinly in drills and transplanted when large enough.
Barley, Cape and Skinless	Green feed	Mar. to June	Mar. to July	Mar. to June	..	..	1 bushel ..	1½ bushel ..	2 to 4	
Barley, Malting ..	Grain	..	May and June	May and June	..	..	1 bushel ..	1½ bushel ..	4½ to 5	
Beans, Broad ..	Market sale	May to June	Apr. to May	May to June	2 6	0 6	2 bushels ..	..	4½ to 5	
Beans, French ..	Market sale	Sept. to Apr.	Oct. to Mar.	Sept. to Mar.	2 6	0 6	35 lb. small 52 lb. large	seeded seeded	2½ to 3	Sowings may be made earlier and later, according to the district's susceptibility to frosts.
Beans, Lima ..	Bush	Sept. to Apr.	Oct. to Jan.	Sept. to Jan.	2 6	0 9	21 lb. small	seeded	3½ to 4	
Do. do. ..	Runner..	Sept. to Apr.	Oct. to Mar.	Sept. to Apr.	4 0	1 0	26 lb. large	seeded		
Beet, Garden varieties	Market sale	Feb. to Apr.	Jan. to Mar.	..	2 0	0 9	4 to 5 lb. ..	..	3 to 4	
Beet, Spinach ..	Stock food	Apr. to June	Apr. to June	..	2 6	1 0	4 lb . ..	..	3 to 4	Foliage of Spinach Beet is reproduced quickly after being cut down and is a profitable crop for fattening purposes.
Broom Millet ..	Fibre for brushware ..	Sept. to Dec.	Oct. to Dec.	Oct. to Dec.	3 6	0 9	4 to 5 lb. ..	..	4½ to 5	
Buckwheat	Bees, green manure, grain, and poultry food	Sept. to Mar.	Sept. to Mar.	Sept. to Feb.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 to 7 weeks of planting.
Cabbage	Market and cattle food	Nearly all seasons except summer	Nearly all seasons except summer	Nearly all seasons except summer	2 6	2 0	1 lb. ..	..	4 to 5	

Canary Seed	Hay and grain	..	May to June	May to June	..	..	15 lb.	..	4½ to 5	
Capsicum	Market sale	Aug. to Oct.	Sept. to Oct.	Sept. to Oct.	2 6	1 6	1 lb.	..	4 to 5	
Carrot, Field	Stock food	Mar. to June	Apr. to May	Mar. to June	1 9	..	2 to 3 lb.	..	4 to 5	
Carrot, Garden	Market sale	Nearly all seasons	Nearly all seasons	Sept. to May	1 6	..	2 to 3 lb.	..	4	
Cassava (Tapioca)	Starch or pig food	Aug. to Sept.	..	..	5 0	2 0	4,356 cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	Feb. and Apr.	Feb. to May	Feb. to Mar.	2 6	2 0	1 lb.	..	6	
Celery	ditto	Jan. to Mar.	Jan. to Mar.	..	4 0	0 6	4 oz.	..	5 to 6	
Chocos	ditto	Aug. to Oct.	..	..	Trellis	..	Chocos	..	4 to 5	
Cotton	Fibre	Sept. to Dec.	Sept. to Nov.	Sept. to Nov.	4 0	2 0	10 to 20 lb.	..	5 to 7	Early cultivation is essential to keep down weeds and grass.
Cow Cane	Cattle food	Sept. to Dec.	..	..	5 0	1 6	5,800 sets	..	7 to 8	
Cowpea	Grain, hay, or green manure	Sept. to Jan.	Oct. to Jan.	Oct. to Jan.	3 0	0 8	10 lb.	15 to 20 lb.	4 to 4½	The non-running varieties are the most suitable for grain.
Cucumber	Market sale	Sept. to Jan.	Oct. to Jan.	Sept. to Jan.	5 0	2 0	1 lb.	..	3	
Egg Plant	ditto	Sept. and Oct.	Sept. and Oct.	Sept. and Oct.	3 0	3 0	1 oz. for 1,000 plants	..	6	
Garlic	ditto	Aug. to Sept.	Aug. to Sept.	..	1 6	0 6	..	..	6	
Ginger	ditto	Aug. to Sept.	..	..	3 0	1 0	5 to 6 cwt.	..	10	
GRASSES—										
Cocksfoot	Pasture	..	Apr. to May	..	..	..	..	1½ bushel	..	
Elephant Grass	Green fodder before the stems harden	Aug. to Oct.	..	..	5 0	2 6	(3,432) cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable. Also propagated from seed.
Italian Rye Grass	Pasture	..	Apr. to May	..	..	..	..	2 bushels		
Paspalum	ditto	Sept. to Jan.	Sept. to Jan.	..	..	..	..	8 to 10 lb.	4 to 6	Sow in rainy season.
Perennial Rye Grass	ditto	..	Apr. to May	..	..	..	..	2 bushels		
Prairie	ditto	Apr. to May	Apr. to May	Apr. to May	..	..	..	1½ to 2 bus.	4 to 5	
Rhodes	ditto	Sept. to Jan.	Sept. to Jan.	Sept. to Jan.	..	..	..	4 to 5 lb.	4 to 6	Sow in rainy season.
HERBS—										
Lavender	Perfume	Aug. to Sept.	Aug. to Sept.	..	4 0	2 0	..	..	12	Propagated from seed or by division of rootlets.
Marjoram	Seasoning	Aug. to Sept.	Aug. to Sept.	Aug. to Sept.	2 6	0 6	..	..	3	Propagated from seed or by division of rootlets.
Mint	ditto	Aug. to Sept.	Aug. to Sept.	..	..	..	..	..	2	Propagated by rootlets only.
Parsley	ditto	Nearly all seasons	Nearly all seasons	..	2 6	..	1 lb.	..	2½ to 3½	

SOUTHERN DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant			How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
					Ft. In.	Ft. In.				
HERBS—*continued.*										
Sage	Seasoning	Aug. to Sept.	Aug. to Sept.	..	2 6	0 9	2 lb. ..	..	3	Propagated from seed or by division of rootlets.
Thyme	Seasoning	Aug. to Sept.	Aug. to Sept.	Aug. to Sept.	2 6	0 6	..	..	3	Propagated from seed or by division of rootlets.
Kale	Stock food	Feb. to June	Feb. to June	..	3 0	2 0	1 lb. ..	..	4	
Kohl Rabi	Market sale, stock food	Mar. to Apr.	Mar. to Apr.	..	2 6	1 6	2 lb. ..	..	4 to 5	
Leek	Market sale	Feb. to Apr.	Feb. to Apr.	..	2 6	0 6	2 lb. ..	..	6 to 8	Transplanted when the leeks are the size of goose quills.
Lettuce	ditto	All seasons ..	All seasons ..	..	2 0	0 9	½ lb. ..	..	3	During dry periods of year sow in drills and thin out.
Linseed (Flax) ..	Fibre and grain ..	May and June	May and June	..	Drilled	..	30 lb. for grain 60 lb. for fibre	..	4½ to 5	Can be treated as an ordinary white cereal crop and harvested with reaper and binder.
Lucerne	Fodder	April to May	April to May	..	Drilled	..	12 to 14 lb.	16 to 20 lb.	1½ to 2	First cutting should take place as soon as the plant will stand up to the mower and before it flowers.
Maize	Grain and silage ..	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 0	1 3	8 to 10 lb.	..	4 to 5	If sown on the "check row" system weeds are more easily dealt with.
Mangel and Sugar Beet	Stock food	Feb. to Apr.	Mar. to June	..	2 6	1 0	5 to 7 lb.	..	6 to 7	
Marrow, Vegetable ..	Market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 to 8 feet	4 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety grown.
Melon, Rock ..	ditto	Aug. to Jan.	Sept. to Dec.	Sept. to Dec.	4 to 6 feet	2 0	1 lb. ..	..	3	Distance apart and time of maturing according to variety.

Melon, Water ..	Market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 to 6 feet	2 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Millet, Foxtail varieties, these include the so-called Giant Panicum	Fodder	Sept. to Jan.	Oct. to Jan.	Sept. to Jan.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain and green fodder	Sept. to Jan.	Sept. to Jan.	Sept. to Jan.	Drilled	..	7 to 8 lb. ..	..	1½ to 2	A useful catch crop.
Mustard	Market sale	All seasons ..	All seasons ..	..	Sown in beds		for salad use	..	..	For farm use, see remarks under Rape.
Oats	Grain and fodder ..	Apr. to June	Apr. to June	Apr. to June	Drilled	..	1½ bushel ..	1½ to 2 bus.	3 to 5	
Onion	Market sale	Apr. to May ..	Mar. to Apr.	Mar. to Apr.	1 0	..	4 lb. ..	..	5 to 6	
Panicum (White) and Japanese Millet	Silage, fodder, and grain	Aug. to Feb.	Sept. to Feb.	Sept. to Feb.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Parsnip	Market sale	Feb. to Mar.	Feb. to Mar.	..	2 0	..	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Mar. to June	Mar. to June	Apr. to June	2 0	..	½ to ⅔ bus.	..	4 to 5	Usually combined with a cereal fodder crop.
Pea, Garden	Market sale	Feb. to Sept.	Mar. to Sept.	Mar. to June	2 0	..	1½ bushel ..	..	3½ to 4	Period of maturity according to variety used.
Peanut	ditto	Aug. to Jan.	Sept. to Dec.	Sept. to Dec.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	Aug. and Feb.	Aug. and Feb.	..	2 6	1 0	8 to 9 cwt.	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	3 to 3½ feet	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Fodder and market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan	8 to 10 feet	3 0	2 lb. ..	..	5 or 6	Distance apart and time of maturing varies according to variety.
Radish	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 0 apart	..	10 to 12 lb.	..	1½	
Rape	Fodder and green manure	Mar. to May	Mar. to May	..	Drilled	..	5 to 6 lb. ..	..	2½ to 4	The addition of 1 lb. of mustard seed to every 5 or 6 lb. will, if sown in conjunction, minimise the tendency of depastured animals to bloat.
Rhubarb	Market sale	Aug. to Oct.	Sept. to Nov.	..	4 0	4 0	1½ lb. ..	..	4 to 5	When propagated from roots quicker returns may be expected.
Rice, Upland ..	Grain and fodder ..	Oct. to Jan.	..	..	Drilled	..	12 to 16 lb.	..	4 to 5	
Rosella	ditto	Aug. to Nov.	Sept. to Oct	..	4 0	3 0	Sow in beds and transplant	..	3 to 4	
Rye	Fodder	Mar. to June	Apr. to June	Apr. to June	Drilled	..	½ to 1 bushel	..	3 to 5	

SOUTHERN DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.			How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
					Ft. In.	Ft. In.				
Shallots	Market sale	Nearly all seasons	Nearly all seasons	..	1 6	0 6	..	..	3 to 4	Propagated by division of the bulbs.
Sorghum, Feed	Fodder and silage	Aug. to Feb.	Sept. to Feb.	Sept. to Jan.	3 6	0 8	4 to 5 lb.	..	3½ to 5	Maturity depends on variety used.
Sorghum, Grain	Grain	Aug. to Feb.	Sept. to Jan.	Sept. to Jan.	3 6	0 8	3 to 4 lb.	..	3½ to 5	
Soudan Grass	Fodder or silage	Sept. to Feb.	Sept. to Jan.	Sept. to Dec.	2 6	..	3 to 4 lb.	..	2	Closer planting permissible.
Soy Beans	Grain	Sept. to Jan.	Oct. to Jan.	..	2 6	0 8	8 to 10 lb.	..	3	
Squash	..	*See* Marrows and Pumpkins.								
Swede	Market sale and stock food	Feb. to May	Feb. to May	..	2 0	1 0	2 lb.	..	4 to 5	
Sweet Corn	Market sale	Aug. to Jan.	Sept. to Jan.	..	3 6	1 3	8 to 10 lb.	..	3	
Tares	Fodder or green manure	Mar. to June	Mar. to June	..	Drilled	..	1 bushel	½ bushel to 1 bushel other grain	3 to 4	For fodder purposes is best used with some form of cereal, such as barley, wheat, or rye.
Tobacco	Leaf	Oct. to Jan.	Oct. to Feb.	Oct. to Jan.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed beds	..	3 to 4	Plants must be raised in specially prepared seed beds and transplanted when strong enough to permanent positions.
Tomato	Market sale	Aug. to Feb.	Sept. to Jan.	Sept. to Jan.	4 0	2 0	½ lb.	..	3 to 4	
Turnip, Field	Stock food	Feb. to June	Feb. to June	..	2 0	1 0	2 to 3 lb.	..	3 to 4	
Turnip, Garden	Market sale	Feb. to June	Feb. to June	..	2 0	0 6	2 lb.	..	2 to 3	
Wheat	Grain and hay	Apr. to May	Apr. to July	Apr. to June	Drilled	..	¾ bushel	1 bushel	3 to 4	Fodder purposes only on coast.

CENTRAL DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
				Ft. In.	Ft. In.				
Arrowroot	Farina and pig food	Aug. to Nov.	..	5 0	2 0	10 to 12 cwt.	..	8 to 10	Propagated by small "bulbs" or tubers.
Artichoke (Jerusalem)	Market sale and pig food	Aug. to Nov.	Sept. to Nov.	3 6	1 6	4 to 5 cwt.	..	4 to 5	
Asparagus	Market sale	Aug.	..	4 0	1 6	7,260 sets	..	18	Propagated from seed or division of roots.
Barley (Cape and Skinless)	Green feed	Mar. to June	Mar. to June	Drilled	0 7	1 bushel	1½ bushel	2 to 4	
Beans, French	Market sale	July to Apr.	Sept. to Jan.	2 6	0 6	..	35 lb. small 52 lb. large	2 to 3	
Beans, Broad	ditto	May to June	..	2 6	0 6	2 bushels	..	4 to 5	
Beans, Lima	ditto	July to Jan.	Sept. to Dec.	4 0	1 0	26 lb. large seeded	..	3 to 4	
Beetroot	ditto	Feb. to Aug.	Sept. to Dec.	2 6	0 9	4 to 5 lb.	..	3 to 4	
Beet, Silver or Spinach	Market sale or stock food	All seasons	Apr. to June	2 6	1 0	4 lb.	..	3	Useful both as a vegetable and as a stock food.
Broom Millet	Fibre for brushware	Aug. to Jan.	Sept. to Dec.	3 6	0 9	4 to 5 lb.	..	4 to 5	
Buckwheat	Bees, green manure, poultry food, and grain	Aug. to Jan.	Sept. to Dec.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 or 7 weeks of planting.
Cabbage	Market sale	Feb. to June	Feb. to June	3 0	2 0	1 lb.	..	4 to 5	
Canary Seed	Grain or hay	Mar. to June	Mar. to June	Drilled	..	15 lb.	..	4½ to 5	Also used as green stuff.
Capsicum	Market sale	Aug. to Nov.	Sept. to Nov.	3 0	2 to 3 ft.	1 lb.	..	4 to 4½	Distance apart according to variety.
Carrot, Field	Stock food	Mar. to June	Sept. to Jan.	1 9	..	3 lb.	..	4 to 5	
Carrots, Garden	Market sale	Mar. to June	Sept. to Jan.	1 6	..	3 to 4 lb.	..	3 to 4	
Cassava (Tapioca)	Starch or pig food	July to Sept.	..	5 0	2 0	Cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	Feb. to May	Feb. to May	3 0	2 0	1 lb.	..	5 to 6	
Celery	ditto	Feb. to Mar.	Feb. to Mar.	4 0	0 6	4 oz.	..	6	
Chocos	ditto	July to Nov.	Sept. to Nov.	Trellis	6 0	..	..	4	

CENTRAL DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
				Ft. In.	Ft. In.				
Cotton	Fibre	July to Oct.	Sept. to Oct.	4 0	2 to 3 ft.	5 lb.	..	4 to 5	
Cow Cane	Cattle food	Sept. Oct. and in Mar.	..	5 0	1 6	5,800 sets	..	7 to 8	
Cowpea	Hay or green manure	Aug. to Feb.	Sept. to Jan.	3 0	0 8	9 to 10 lb.	15 lb.	4 to 4½	
Cucumber	Market sale	July to Jan.	Aug. to Dec.	4 0	2 0	1 lb.	..	3	
Egg Plant	ditto	July to Oct.	Aug. to Oct.	3 0	1 6	..	1 oz. for 1,000 plants	6	
Garlic	ditto	Mar. to May	..	1 6	4 to 6 in.	..	..	6	
Ginger	ditto	Aug. to Nov.	..	3 0	1 0	5 to 6 cwt.	..	9 to 10	
GRASSES—									
Elephant	Green fodder, before the stems harden	Jan. to Mar. Aug. to Oct.	..	5 0	2 6	3,432 cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable. (Also propagated from seed.)
Paspalum	Pasture	Aug. to Dec. Jan. to Mar.	..	..	..	..	8 to 10 lb.	4 to 6	Is established more readily in the wet season, Jan. to Mar.
Prairie	ditto	Mar. to Apr.	..	..	..	..	1½ bushel	4 to 5	Only suitable for localities favoured with winter rains.
Rhodes	ditto	Aug. to Dec.	..	..	..	..	4 to 5 lb.	4 to 6	Seed germinates readily in the wet season, Jan. to Mar., and in cloudy weather.
Kohl Rabi	Market sale	Mar. to May	..	2 6	1 6	2 lb.	..	3 to 4	
Leek	Domestic use	Mar. to May	..	2 6	0 6	2 lb.	..	6 to 8	
Lettuce	Market sale	Mar. to Sept.	..	2 0	0 9	½ lb.	..	3	
Linseed (Flax)	Seed	Apr. to June	..	Drilled	..	25 to 30 lb.	..	4½ to 5	
Lucerne	Hay and green stuff	Apr. to June	..	Drilled	..	12 to 14 lb.	16 to 20 lb.	Perennial	
Maize	Grain and silage	Aug. to Jan.	Sept. to Dec.	4 0	1 3	8 to 10 lb.	..	4 to 5	For silage in forest country and in freshly cleared scrub lands, 10 to 15 lb. of seed per acre.
Mangel and Sugar Beet	Stock food	Mar. to June and in Aug.	Sept. to Oct.	2 6	1 6	5 to 7 lb.	..	6 to 7	

Marrow, Vegetable ..	Market sale	July to Mar.	Sept. to Jan.	4 to 8 ft.	3 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Rock ..	ditto	July to Sept.	Sept. to Oct.	4 to 6 ft.	2 0	1 lb. ..	..	3	Distance apart and time of maturing according to variety.
Melon, Water ..	ditto	July to Oct.	Sept. to Oct.	4 to 6 ft.	2 0	2 lb. ..	..	3 to 4	
Millet, Foxtail varieties, these include the so-called Giant Panicum	Hay and silage	Aug. to Jan.	Sept to Dec.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain and green fodder ..	Aug. to Feb.	Sept. to Jan.	Drilled	..	7 to 8 lb. ..	..	1½ to 2	
Oats	Hay and green stuff	Apr. to June	Apr. to June	Drilled	..	1½ bushel ..	1½ to 2 bus.	4 to 5	
Onion	Market sale	Apr. to June	Apr. to June	1 0	0 4	4 lb. ..	..	6	
Panicum (White) and Japanese Millet	Silage, hay, and green stuff ..	Aug. to Feb.	Aug. to Feb.	Drilled	..	14 to 16 lb.	..	2	Should be cut for hay before seed forms.
Parsley	Market sale	Nearly all seasons	Nearly all seasons	2 6	..	1 lb. ..	..	2½ to 3½	
Parsnip	ditto	Mar. to Apr.	Mar. to Apr.	2 0	0 6	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Mar. to June	Apr. to June	2 0	..	½ to ¾ bus.	..	4 to 5	Invariably sown with a cereal, half bushel field pea, 1 bushel wheat, &c.
Pea, Garden	Market sale	Mar. to June	Apr. to June	2 0	..	1½ bushel ..	..	3½ to 4	Period of growth according to variety.
Peanut	ditto	Aug. to Nov.	Sept. to Nov.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	July and Feb.	Aug. and Feb.	3 0	1 0	8 cwt. ..	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Dec.	Sept. to Nov.	3 to 4 ft.	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Market sale and stock food ..	July to Nov.	Sept. to Nov.	8 to 10ft.	4 0	2 lb. ..	..	5 to 6	Distance apart and period of growth varies according to variety.
Radish	Market sale	All seasons ..	All seasons ..	1 0	0 3	10 to 12 lb.	..	1½	
Rape	Fodder and green manuring ..	Mar. to June	..	Drilled	..	3 to 4 lb. ..	6 to 8 lb. ..	4 to 5	Can be grazed off in 6 to 8 weeks. Should be sown with 1 lb. mustard to every 5 or 6 lb. or rape seed to prevent bloat.
Rhubarb	Market sale	Aug. to Sept.	..	4 0	4 0	Roots ..	..	2	
Rice, Upland ..	Grain or hay	Oct. to Dec.	..	Drilled	..	20 lb. ..	..	4 to 5	
Rosella	Market sale	Aug. to Oct.	..	4 0	3 0	..	..	3 to 4	
Rye	Fodder	Mar. to June	..	Drilled	..	¾ bushel ..	..	3 to 5	
Shallot	Market sale	All seasons ..	All seasons ..	1 6	0 6	..	..	..	Propagated by division of the bulbs.
Sorghum, Feed ..	Fodder and silage	Aug. to Feb.	Sept. to Dec.	3 6	0 8	4 to 5 lb. ..	..	3 to 4	Period of growth varies according to variety.

CENTRAL DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
				Ft. In.	Ft. In.				
Sorghum, Grain	Grain	Aug. to Feb.	Sept. to Dec.	3 6	0 8	4 lb.	..	4	Period of maturing according to variety.
Soudan Grass	Hay or silage	Aug. to Jan.	Sept. to Dec.	2 6	..	3 to 4 lb.	..	2 to 3	On clean land drills may be 14 in. apart, 8 to 9 lb. of seed being required.
Soy Beans	Grain	Aug. to Jan.	..	2 6	0 8	10 lb.	..	3 to 4	
Squash	..	..	..	..	..	*See* Marrows and Pumpkins.			
Sunflower	Grain	Aug. to Nov.	Sept. to Nov.	4 0	1 6	6 lb.	..	4 to 5	
Swede	Market sale and stock food	Mar. to June	..	2 0	1 0	2 to 3 lb.	..	3 to 4	
Sweet Corn	Market sale	Aug. to Jan.	Sept. to Jan.	3 to 4 ft.	1 0	8 to 10 lb.	..	3	Should be planted when the flowering season will not coincide with that of ordinary maize planted alongside.
Tares	Fodder or green manure	Mar. to June	..	Drilled	..	1¼ bushel	½ bushel with 1 bushel cereals	4	
Tobacco	Leaf	Oct. to Jan.	Oct. to Feb.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed beds	Transplanted	3 to 4	
Tomato	Market sale	All seasons	Aug. to Dec.	4 0	2 0	¼ lb.	Transplanted	3 to 4	
Turnip, Field	Stock food	Mar. to June	..	2 0	1 0	2 to 3 lb.	..	3	
Turnip, Garden	Market sale	Mar. to July	..	2 0	0 6	2 lb.	..	2 to 3	
Wheat	Hay or green fodder	Apr. to June	Apr. to June	Drilled	..	1 bushel	1½ bushel	4 to 5	For costal districts, only rust-resisting hay wheats suitable.

NOTES ON NORTHERN SEED TABLES.

The Northern districts vary greatly in their rainfall; also in the quantities that fall in each month. Thus, on the coastal strip Mackay and Proserpine enjoy a greater and better distributed rainfall than Bowen, the lower Burdekin, and Townsville; while from Ingham through to Cairns much the heaviest rainfall in the State is experienced. Similarly, on the Tablelands certain areas, such as Ravenshoe, Millaa Millaa, and along the watershed of the Johnstone and Russell Rivers and near the crest of the coastal range, a much heavier and better distributed rainfall obtains than a little further back.

The inland districts are not so variable as the coastal areas in their periods and quantity of rainfall.

The compilation of the present table must be looked at as a general guide and sowings made with regard to the season generally experienced in a particular locality. Generally, crops are best planted at the commencement of the monsoonal rains or wet season, starting usually in November or December. Other plantings are made towards the close of the wet season or when extra heavy rains will not cause injury to the growing crop. When about to plant, growers should consider the month the crop is likely to be harvested and arrange accordingly.

In districts of heavy rainfall many root crops, even on well-drained land, are liable to rot out. In potato planting on the Tablelands and inland it is advisable to plant before the wet season commences. The tubers will make a certain amount of root-growth, and shoots will appear on the surface in a short time after the first shower. Growth is then rapid, and when the heavier rains fall the foliage can better cope with excess moisture. The crop planted before the wet season begins always gives a heavier yield and better tubers than one planted after it.

On the Tablelands another planting can be made in February or March. Seed grown from this crop can be held for planting the main crop in October.

It is well to note that whole sets are always preferable in North Queensland to cut tubers.

In the inland districts where irrigation is practised the planting season in many instances can be extended, but due regard must be held of the likelihood of frosts.

NORTHERN AND TABLELAND DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant.			How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
					Ft. In.	Ft. In.				
Arrowroot	Farina and pig food	Aug. to Nov.	Aug. to Jan.	Oct. to Jan.	5 0	3 6	2,000-2,500 sets	..	8 to 10	Fresh land should be planted each year.
Artichoke (Jerusalem)	Stock food	July to Aug.	July to Dec.	July to Dec.	3 6	1 6	4 to 5 cwt.	..	4 to 5	Difficult to store; will keep better in the soil.
Asparagus	Domestic use	..	Sept.	..	4 0	1 6	7,260 roots	..	..	Suited only to the Tablelands and comparatively cooler districts.
Barley, Cape and Skinless	Green feed	Mar. to June	Feb. to June	Feb. to Apr.	..	..	1 bushel	1½ bushel	3	
Beans, French	Market sale	Apr. to Aug.	Aug. to Apr.	Feb. to Aug.	2 0	0 6	1 qt. to 100 ft. of drill	..	2½ to 3	
Beans, Lima	ditto	Mar. to Apr.	Dec. to Jan.	Nov. to Jan.	4 0	1 3	26 lb.	..	4 to 5	Only advisable as a field crop where fine weather can be depended on for harvesting.
Beet, Silver or Spinach	Stock food	Mar. to Aug.	Feb. to Sept.	Feb. to July	2 6	..	4 to 5 lb.	..	3	
Beetroot	Domestic use	Mar. to Aug.	Feb. to Sept.	Feb. to July	2 6	0 9	4 lb.	..	3	
Broom Millet	Brushware	Feb. to Mar.	Dec. to Feb.	Dec. to Feb.	3 4	0 9	4 to 5 lb.	..	4	
Buckwheat	Fodder, grain, and green manure	..	Dec. to Apr.	Dec. to Apr.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	
Cabbage	Market sale	Feb. to July	Jan. to Aug.	Jan. to Aug.	2 6 to 3 0	2 0	1 lb.	..	4	
Capsicum	Domestic use	Apr. to Oct.	Aug. to Oct.	Aug. to Oct.	3 0	2 0	1 lb.	..	4 to 5	Where districts are free from frost these may be planted all the year round.
Carrots, Field	Stock food	Apr. to Sep.	Feb. to Sept.	Feb. to Apr.	2 0	..	3 to 4 lb.	..	4 to 5	
Carrots, Garden	Market sale	Feb. to Oct.	Feb. to Oct.	Feb. to Oct.	1 6	..	4 lb.	..	4	

Cassava (Tapioca)	Starch, or pig food	July to May	Sept. to Jan.	..	5 0	2 0	4,356 cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	April to May	Jan. to May	Jan. to May	3 0	2 0	1 lb.	..	5 to 6	
Celery	Domestic use	..	Jan. to Mar.	..	4 0	0 6	4 oz.	..	5 to 6	
Chocos	Market sale	July to Oct.	Aug. to April	Aug. to Apr.	Trellis	6 0	..	..	4 to 5	
Cotton	Fibre	Feb. to July	Sept. to Jan.	Sept. to Jan.	4 0	2 0 to 3 0	5 to 6 lb.	..	4 to 5	
Cow Cane	Fodder	Oct. to May	Oct. to May	Oct. to Apr.	5 0	2 0	..	4,356 sets.	7 to 8	
Cowpea	Fodder and green manure	Aug. to May	Sept. to Feb.	Nov. to Feb.	3 0	..	10 lb.	15 to 20 lb.	4½	
Cucumber	Market sale	Nearly all seasons	Nearly all seasons	..	5 0	2 0	1 lb.	..	3	Where districts are free from frosts these can be planted all the year round.
Egg Plant	Domestic use	Mar. to July	Nov. to Feb.	Nov. to Feb.	3 0	3 0	1 oz. for 1,000 plants	..	6	
Garlic	Market sale	Mar. to May	Aug. to Sept.	..	1 6	0 6	..	..	6	
Ginger	ditto	Aug. to Nov.	Oct. to Jan.	Oct. to Jan.	3 0	1 0 to 1 6	5 to 6 cwt.	..	10	
GRASSES—										
Elephant	Green fodder before the stems harden	Aug. to Oct.	Aug. to Oct.	..	5 0	2 6	3,432 cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable (also propagated from seed).
Panicum muticum	ditto	Aug. to May	Aug. to May	..	6 0	6 0	Rootlets	..	4 to 5	
Paspalum	Pasture	Early rains	Early rains	Early rains	..	..	..	8 to 10 lb.		
Prairie	ditto	..	Mar. to Apr.	..	..	..	..	30 to 40 lb.	4 to 5	
Rhodes	ditto	Early rains	Early rains or mid wet season	Early rains	..	..	..	4 to 5 lb.	4 to 6	Sow in rainy season.
HERBS—										
Lavender	Perfume	Mar.	Aug. to Sept.	..	4 0	2 0	..	..	..	Propagated from seed or by division of rootlets.
Marjoram	..	..	Aug. to Sept.	..	2 6	0 6	..	..	..	3 months from rootlets.
Mint	..	Aug.	Aug. to Sept.	..	..	..	..	..	..	
Sage	..	..	Aug. to Sept.	..	2 6	0 9	..	..	..	3 months from rootlets.
Thyme	..	..	Aug. to Sept.	..	2 6	0 6	..	..	..	3 months from rootlets.
Kohl Rabi	Market sale	Mar. to Apr.	Feb. to Apr.	Feb. to Apr.	2 6	1 6	2 lb.	..	4 to 5	
Leek	Domestic use	Mar. to May	Feb. to Apr.	Feb. to Apr.	2 0	0 6	2 lb.	..	..	Suited only to the cooler districts of the North. Have seen good leeks on the coast, also inland in the North.
Lettuce	Market sale	Mar. to Aug.	Mar. to Sept.	Mar. to Aug.	2 0	0 9	¼ lb.	..	3	
Linseed (Flax)	Grain	..	Jan. to Feb.	..	..	..	30 lb.	..	5	
Lucerne	Fodder	Mar. to Apr.	Feb. to May	Feb. to May	Drilled	..	12 to 14 lb.	16 to 20 lb.	Perennial	

NORTHERN AND TABLELAND DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.			How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
					Ft. In.	Ft. In.				
Maize	Grain and silage	Feb. to Aug.	Nov. to Jan.	Nov. to Jan.	4 0	1 6	8 to 10 lb.	..	4 to 5	
Mangel and Sugar Beet	Stock food	..	Feb. to Mar.	..	2 6	1 3	5 to 7 lb.	..	6 to 7	
Marrow, Vegetable	Market sale	Sept. to Feb.	Nov. to Feb.	..	4 to 8 ft.	3 0	2 lb.	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Rock	ditto	July to Feb.	Nov. to Feb.	Aug. to Feb.	4 to 6 ft.	2 0	1 lb.	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Water	ditto	July to Feb.	Aug. to Jan.	Aug. to Jan.	4 to 6 ft.	2 0	2 lb.	..	3 to 4	
Millet, Foxtail varieties, these include the so-called Giant Panicum	Fodder	Oct. to Mar.	Aug. to Mar.	Dec. to Feb.	..	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French	Grain	..	Aug. to Feb.	..	..	..	8 to 10 lb.	..	1½	No good in tropics
Oats	Green feed	May to June	Mar. to June	Feb. to Apr.	..	..	1½ bushel	1½ to 2 bus.	4 to 5	
Onion	Market sale	Mar. to May	Mar. to May	Mar. to Apr.	1 0	..	4 lb.	..	5 to 6	
Panicum (White) and Japanese Millet	Silage, hay, and green fodder	Oct. to May	Sept. to Mar.	Oct. to Mar.	..	..	14 to 16 lb.	..	2	
Parsley	Market sale	Mar.	Feb.	Feb.	2 6	..	1 lb.	..	2½ to 3½	
Parsnip	ditto	Feb. to Apr.	Jan. to Apr.	Jan. to Apr.	2 0	0 9	1 lb.	..	6 to 7	
Pea, Field	Fodder	Apr. to June	Feb. to June	Mar. to Apr.	2 0	..	½ to ¾ bus.	..	4 to 5	Usually combined with a cereal fodder crop.
Pea, Garden	Market sale	Mar. to May	Feb. to June	Mar. to May	2 0	..	1½ bushel	..	4	Period of maturing according to variety.
Peanut	ditto	Nov. to Mar.	Nov. to Feb.	Nov. to Feb.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	Mar. to June	Oct. to Dec. Feb. to Mar.	Oct. to Dec. Feb. to Mar.	3 0	1 0	8 cwt.	..	3 to 4	
Potato, Sweet	ditto	Aug. to Mar.	Oct. to Feb.	Oct. to Feb.	3 to 3½ ft.	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Market sale and stock food	Mar. to Apr. and from Aug. to Nov.	Nov. to Feb.	Nov. to Feb.	6 to 8 ft.	3 to 4 ft.	2 lb.	..	5 to 6	Distance apart and period varies according to variety.
Radish	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 0	..	10 to 12 lb.	..	1½	

Rape	Fodder and green manure	Apr. to July	Mar. to May	Mar. to Apr.	..	..	5 to 6 lb.	..	4 to 5		
Rhubarb	Market sale	Aug. to Sept.	Sept. to Nov.	Sept. to Nov.	4 0	4 0	1½ lb.	..	4 to 5		When propagated from roots quicker returns may be expected.
Rice, Upland	Grain	Sept. to Apr.	Oct. to Feb.	Oct. to Jan.	Drilled	..	12 to 16 lb.	40 to 50 lb.	4 to 6		Harvest when half seed head is yellow. Stack and thresh after 6 weeks.
Rosella	Market sale	Sept. to Feb.	Oct. to Feb.	Oct. to Jan.	3 to 4 ft.	3 0	..	..	3 to 4		
Rye	Fodder	Mar. to July	Mar. to June	Mar. to May	Drilled	..	¾ to 1 bus.	..	4		
Shallot	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 6	0 6	..	..	3 to 4		
Sorghum, Feed	Fodder and silage	Nov. to May	Nov. to Mar.	Nov. to Feb.	3 6	0 8	4 to 5 lb.	..	3 to 4		
Sorghum, Grain	Grain	Nov. to May	Nov. to Mar.	Nov. to Feb.	3 6	0 8	3 to 4 lb.	..	4		
Soudan Grass	Hay or silage	Early rains	Early rains	Early rains	2 6	..	3 to 4 lb.	..	2		
Soy Beans	Grain	May to July	Sept. to Jan.	Sept. to Jan.	2 6	0 8	10 lb.	..	3		
Swede	Market sale	Mar. to May	Feb. to May	Feb. to Apr.	2 0	1 0	2 to 3 lb.	..	4 to 5		
Sweet Corn	ditto	Aug. to Jan.	Nov. to Jan.	Nov. to Jan.	3 6	1 0	8 to 10 lb.	..	3		
Tares	Fodder or green manure	Same as Field Peas.		..	..	..	1¼ bushel	½ bushel with 1 bushel of other grain	4		For fodder purposes it is best sown with some other form of cereal.
Tobacco	Leaf	Oct. to Jan.	Oct. to Dec.	Oct. to Dec.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed bed	..	3 to 4		Seeds must be sown in specially prepared seed beds and transplanted during period.
Tomato	Market sale	Feb. to July	Nov. to July	Nov. to July	4 0	2 0	½ lb.	..	3 to 4		
Turnip, Garden	ditto	Apr. to June	Feb. to May	Mar. to May	2 0	0 6	2 lb.	..	2 to 3		
Wheat	Hay, or green fodder	Mar. to June	Feb. to June	Mar. to May	Drilled	..	40 to 60 lb.	..	4 to 5		Fodder purposes only.

PLATE 48.

PRESENTATION OF STAFF AND STUDENTS OF THE AGRICULTURAL COLLEGE TO H.R.H. THE DUKE OF GLOUCESTER.

Not only once or twice, but even thrice, the Duke of Gloucester mentioned to His Excellency the Governor (Sir Leslie Wilson), how pleased and impressed he was with the work, both practical and theoretical, which, on his visit to the Q.A.H.S. and College, at Gatton, on 4th December, he noted was being done for the people of Queensland.

PLATE 49.

ROYAL VISIT TO QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, 4TH DECEMBER.

H.R.H. the Duke of Gloucester meeting Students and Staff in the College Grounds. Accompanying the Duke are the Premier (Hon. W. Forgan Smith), the Minister for Public Instruction (Hon. F. A. Cooper), and Professor J. K. Murray, Principal.

NEW HIGHWAYS IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

THE Thirteenth Annual Report of the Commissioner for Main Roads, Mr. J. R. Kemp, is an impressive record of rural development in Queensland. During the year considerable progress was made in extensive developmental projects in every division of the State, as indicated in Mr. Kemp's notes on his inspectional visits—an interesting feature of his report. Up to 30th June last 2,645 miles, comprising works of various types, from clearing and drainage to concrete and bitumen surfacing, had been completed; while 458 miles were under construction at that date, together with 83 miles of works to convert previously constructed roads to a higher type.

Works were undertaken in 139 Local Authority areas, and a maximum number of 3,550 men per month were employed.

In general, works are proceeding at the rate of about 1½ mile of road completed per working day. In addition to the road mileage shown above, about 9 miles of bridges have been constructed, and 3,307 feet are in hand. There are now 10,568.7 miles gazetted under the Main Roads Acts—including State Highways, 2,263.63, Main roads 7,839.14, developmental roads 292.45, and tourist roads 173.48.

It has not been possible to undertake construction on all of these roads during the year, but endeavours are being made to spread the expenditure of funds over as wide an area as possible.

Where permanent works have not been undertaken maintenance funds have been provided in order to keep the roads in a reasonably trafficable condition.

Consultations with Local Authorities are constantly taking place so as to ensure that the works of greatest urgency are first undertaken, and gradually the links are being forged together into a chain of roads extending over the length and breadth of the State.

Through the courtesy of the Commission we are able to reproduce a series of excellent illustrations, taken from the report, and which indicate the immense value of a great community service.

PLATE 50.

ROSEWOOD SHIRE.—BRISBANE-TOOWOOMBA ROAD (HOSPITAL HILL).

PLATE 51.
CLIFTON SHIRE.—CLIFTON-PITTSWORTH ROAD.
Cement penetration.

PLATE 52.
LIVINGSTONE SHIRE.—FARNBOROUGH-BYFIELD ROAD.
Constructed June, 1934.

PLATE 53.

COMPLETED METALLED SECTION READY FOR TRIMMING AND BITUMEN SURFACE—NORTHERN HIGHWAY (REDCLIFFE-CABOOLTURE SECTION).

PLATE 54.

NORTH COAST ROAD (REDCLIFFE-CABOOLTURE SECTION).

Finished pavement.

Plate 55.

Cambooya Shire.—Greenmount-Hirstvale Road, looking towards Toowoomba.

Plate 56.

Pioneer Shire.—Mackay-Habana Road.

Flood invert section on road serving cane-growing and dairying district north-west of Mackay.

PLATE 57.
ROSELLA-HOMEBUSH ROAD.
Serving cane-growing area.

PLATE 58.
DOUGLAS SHIRE.—CAIRNS-PORT DOUGLAS ROAD.

PLATE 59.
PACIFIC HIGHWAY (MAIN SOUTH COAST ROAD).
Night visibility discs on curves.

PLATE 60.
CAIRNS-PORT DOUGLAS ROAD.—STRATFORD BRIDGE OVER THE BARRON RIVER.

PLATE 61.
MIRANI SHIRE.—MARIAN-NETHERDALE ROAD-CATTLE CREEK BRIDGE EXTENSION.
Extension to existing bridge erected by Shire Council. The maintenance of the approaches was a constant source of expense to the Council.

PLATE 62.
MAROOCHY SHIRE.—MARY RIVER ROAD.
Bridge over Little Yabba Creek.

PLATE 63.
BRISBANE-TOOWOOMBA ROAD.
Rolling and smoothing after drag operations.

PLATE 64.
DRAG SPREADING (WITH 8 FEET DRAG) ON BRISBANE-TOOWOOMBA ROAD.
Spreading operation completed.

PLATE 65.
CRUSHING AND MIXING OPERATIONS ON BRISBANE-TOOWOOMBA ROAD.

PLATE 66.
SPRAYING TAR ON THE BUNDABERG-GIN GIN ROAD.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from 3rd January, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for January, February, and March, 1935:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 15th January, 1935—"The Place of Plant Breeding in Agriculture," by Dr. L. G. Miles, Plant Breeder.

Thursday, 17th January, 1935—"The Trend of Agricultural Economics," by Hon. Frank W. Bulcock, M.L.A., Secretary for Agriculture and Stock.

Tuesday, 22nd January, 1935—"The Problem of Youth—The Call of the Land," by J. F. F. Reid, Editor of Publications.

Thursday, 24th January, 1935—"A New Deal for the Farmer," by J. F. F. Reid, Editor of Publications.

Tuesday, 29th January, 1935—"Frost Prevention by Orchard Heating," by H. Barnes, Director of Fruit Culture.

Thursday, 31st January, 1935—"Wheat in Queensland," by H. W. Ball, Assistant Experimentalist.

Tuesday, 5th February, 1935—"The Rural Revival in Britain—What it Means to the Australian Producer," by J. F. F. Reid, Editor of Publications.

Thursday, 7th February, 1935—"Grading Cotton," by R. W. Peters, Cotton Experimentalist.

Tuesday, 12th February, 1935—"Winter Legumes and other Fodders," by C. T. White, Government Botanist.

Thursday, 14th February, 1935—"Some Notes on Our Inland Pastures," by S. L. Everist.

Tuesday, 19th February, 1935—"Management of Paspalum Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 21st February, 1935—"The Cultivation of Lucerne," by A. E. Gibson, Director of Agriculture.

Tuesday, 26th February, 1935—"The Effects of Fertilizers on the Quality of Tobacco Leaf," by W. J. Cartmill, B.Sc.

Thursday, 28th February, 1935—"Snapping Cotton," by R. W. Peters, Cotton Experimentalist.

Tuesday, 5th March, 1935—"The Activities of Sheep and Wool Branch with Special Mention of the Farmers' Wool Scheme," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 7th March, 1935—"Sheep Licks," by J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 12th March, 1935—"Winter Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 14th March, 1935—"Grape Culture," by H. Barnes, Director of Fruit Culture.

Tuesday, 19th March, 1935—"Some Remarks on Animal Nutrition," Part I., by E. H. Gurney, Agricultural Chemist.

Thursday, 21st March, 1935—"Some Remarks on Animal Nutrition," Part II., by E. H. Gurney, Agricultural Chemist.

Tuesday, 26th March, 1935—"Observations on Tobacco Fertilizer Trials," by W. J. Cartmill, B.Sc.

Thursday, 28th March, 1935—"Expanding our Export Trade," by J. F. F. Reid, Editor of Publications.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register for the Herd Book of the Australian Illawarra Shorthorn Society, Jersey Cattle Society, Friesian Cattle Society, Guernsey Cattle Society, production charts for which were compiled for the month of November, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cows (over 5 Years), Standard 350 Lb.				
Handsome 6th of Oakvilla	T. Strain, Wondai	11,495·35	465·605	Victory of Greyleigh
Empress 13th of Sunnyside	P. Moore, Wooroolin	10,400·14	426·074	Emblem of Sunnyside
Senior, 4 Years Old (over 4½ Years), Standard 330 Lb.				
Clonogan Mignonette	T. Strain, Wondai	10,046·41	380·483	Jerry of Cosy Camp
Senior, 3 Years Old (over 3½ Years), Standard 290 Lb.				
Marn Patty	R. Martin, Biggenden	9,743·15	464·798	Triumph of Happy Valley
Junior, 3 Years Old (under 3½ Years), Standard 270 Lb.				
Kalinga Roseleaf 2nd	J. A. Heading, Cloyna	7,361·81	305·576	Bruce Galvallis
Merridale Mermaid	H. D. Giles, Biggenden	6,423·05	290·022	Premier of Lanefield
Senior, 2 Years Old (over 2½ Years), Standard 250 Lb.				
Marn Betty	R. Martin, Biggenden	7,345·25	340·208	Happy Valley Happy Lad
Lyndith Queenie 5th	S. H. Teese, Veresdale	7,999·75	278·206	Brooklyn Terrace, President
Junior, 2 Years Old (under 2½ Years). Standard 230 Lb.				
Sunnyview Bess	J. Phillips, Wondai	13,017·16	507·425	Lovely's Commodore of Burradale
Montcairn Melba	A. E. Vohland, Aubigny	7,312·25	316·066	Viceroy of Wilga Vale
Blackland's Carnation	A. M. Johnson, Gracemere	6,909·4	264·074	Park View Limelight
Cedargrove Ita 11th	W. J. Freeman, Rosewood	6,034·5	257·670	Duke of Cedar Grove
Penrhos Beauty	A. Sandilands, Wildash	5,547·5	247·180	Rosenthal's Pendant's Prince
Mountain Home Gem 8th	M. C. Lester, Laidley Creek	6,253·01	239·876	Headlight of Greyleigh
Penrhos Plum 2nd	A. Sandilands, Wildash	5,920·5	234·712	Rosenthal Pendant's Prince

JERSEY.

JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.

Glenview Sunflower	F. P. Fowler & Sons, Biggenden	5,536·	327·064	Trinity Officer
Trecarne Merle IV.	D. R. Hutton, Cunningham	5,425·75	300·173	Trecarne Golden King
Glenview Choice	F. P. Fowler & Sons, Biggenden	4,821·75	283·983	Trinity Officer
Glenview Lady Lynn	F. P. Fowler & Sons, Biggenden	4,449·5	282·212	Carlyle Larkspur 2nd Empire
Glenview Viscountess	F. P. Fowler & Sons, Biggenden	3,897·45	239·019	Carlyle Larkspur 2nd Empire

FRIESIAN.

SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.

Oakland Maria Pearl	W, Richters, Tingoora	9,382·32	332·143	Pied Rock

GUERNSEY.

JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.

Willow Brae Sequel	H. Blanck, Eudlo	4,867·8	276·785	Linwood Lone Star

Crown Land for Selection.

SHEEP COUNTRY.

BLACKALL DISTRICT.

LORNE AND TERRICK TERRICK RESUMPTIONS.

67,316 acres.

(To be open at the Land Office, Blackall, on Thursday, 7th February, 1935.)

Comprising portion 5, parish of Berriedale, situated about 30 miles south of Blackall, and portions 5, parish of Lauriston, and 2, parish of Maindample, situated about 25 miles south-west of Blackall.

The country comprises open and well-shaded downs, well grassed with Mitchell, blue, and Flinders grasses, and is watered by bores and tanks.

The land is good sheep country, suitable for woolgrowing, breeding, and fattening.

Annual rent is 4d. per acre for the first seven years; also

LONGREACH DISTRICT.

PORTLAND DOWNS RESUMPTION.

44,462 acres.

(To be open at the Land Office, Longreach, on Thursday, 21st February, 1935.)

Comprising portions 1, parish of Seaford, and 4, parish of Tylden, situated about 25 miles and 30 miles north-east from Isisford.

Portion 1, parish of Seaford, is watered by the Barcoo River and by a tank and bore drain, and portion 4, parish of Tylden, by creeks, dams, and a bore drain.

The country is partly open downs, timbered with gidyea and boree, and grassed with Mitchell, blue, Flinders, and other grasses.

The land is good sheep country, suitable for woolgrowing, breeding, and fattening.

The annual rent for the first seven years is 3½d. per acre for portion 1, and 2¾d. per acre for portion 4.

Portion 4, parish of Tylden, will be subject to the condition that 2,500 acres shall be ringbarked within five years.

The term of lease in each case is twenty-eight years. During the first three years each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep, and must be enclosed with a rabbit and marsupial-proof fence.

Free lithographs and full particulars obtainable from the Land Agents, Blackall and Longreach, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence Bureaux, Sydney, and Melbourne.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

"Chinese Cabbage."

J.W. (Capella)—

The specimens have been determined as *Brassica juncea*, a common weed in cultivations. In some parts of the south coast of Queensland it is known locally as Chinese Cabbage. It probably has some nutritive value as a fodder, but in the case of milking cows it may possibly impart a disagreeable flavour to the milk.

Winter Sweet or "Bushman's Poison."

E.J. (Auchenflower)—

The specimen forwarded is *Acocanthera spectabilis*, better known to nurserymen as *Toxicophlœa spectabilis*, the Winter Sweet or Bushman's Poison. It is a native of South Africa, and much cultivated as an ornamental shrub. A list of poisonous plants in the Brisbane Gardens was published recently, and a friend in Melbourne said he noticed the list and was surprised to see *Acocanthera* in it. Mr. Cronin, the Director of the Melbourne Botanic Gardens, had informed him that both himself and his children had eaten the fruits of this tree quite freely without any ill-effects following. The plant, however, is undoubtedly a poisonous one. We have never heard of persons being actually poisoned in the way you mention through handling the leaves and flowers, although the flowers are commonly used by nurserymen particularly for making up wreaths, crosses, &c. We were very interested to have your note on the plant. As you know, with these irritant plant poisons some people are much more sensitive than others.

Tick Trefoil. Barbed Wire Grass. Pimpernel. Vicia Sativa.

W.C. (Buderim Mountain)—

1. *Desmodium triflorum*, a species of Tick Trefoil, quite a valuable legume in the pasture. It is eaten by stock, the only objection to it being that it grows rather too close to the ground to give animals much of a bite. The name Tick Trefoil refers to the small pods being broken off in small pieces, which adhere to clothing, to the hairs of animals, &c., by means of minute hooked hairs or bristles.
2. *Cymbopogon refractus*, Barbed Wire Grass. The local name is given on account of the peculiar way the spikelets bend back. Not of much value as a fodder.
3. *Anagallis arvensis*, Pimpernel, a common farm weed in Queensland. It is poisonous to stock but rarely eaten by them in sufficient quantities to cause trouble. Several years ago we received from your district seeds taken from the stomach of a cow supposed to have died from plant poisoning.
4. *Vicia sativa* var. *segetalis*, a variety of the common Vetch; quite a good fodder. It often comes up spontaneously in cultivation paddocks, along railway cuttings, roadsides, &c.

Brazillian Clover.

E.W. (Roma)—

Your specimen represents *Jacksonia brasiliensis*, commonly called Mexican or Brazilian Clover, although the plant does not belong to the clover family nor is it even closely related to the clovers and trefoils. Although it has been highly spoken of as a fodder at odd times, our experience with it in Queensland is that stock rarely take to it. Most of our experience with it is as a weed on coastal orchards where it is extremely abundant, particularly in some of the pineapple plantations on the North Coast Line. We do not think there is much to fear from it in the general pasture, as it is mostly a weed of cultivation or any place where the ground has been disturbed. It is possible that in the drier climate of the Maranoa district the plant might be more palatable, particularly in the stages when it is drying off somewhat. Very often cattle refuse this type of plant when it is green and luxuriant and eat it readily enough in the form of hay or when it is drying off naturally.

Red Leg or Bitter Blue Grass.

J.G. (Ridgelands)—

Your specimen represents the Red Leg or Bitter Blue Grass (*Bothriochloa decipiens*), a native grass very abundant in many localities. As the better grasses are eaten out this grass persists, and in some parts of coastal Queensland and in the Lockyer and Fassifern districts it becomes the dominating grass in the native pasture. So far as we have experienced stock do not take readily to it, and where possible it is advisable to try and introduce better grasses to smother it out.

Cape Cotton.

J.D.F. (Jimbour)—

The specimen is *Gomphocarpus fruiticosus*, the Cape Cotton, also called Wild Cotton or Balloon Cotton. It belongs to a poisonous family and we believe is poisonous to stock, but they rarely eat it in sufficient quantities to cause trouble. It is a native of South Africa but has been naturalised in Queensland and New South Wales for many years now. In this State it is most abundant on scrub coastal farms, but of recent years it seems to be spreading inland, particularly on cleared scrub country. If allowed to spread it certainly does smother country very rapidly and we have seen it on the coast as thick as Scotch Thistle; sometimes is on the Downs and in the Maranoa district.

Wandoan Plants Identified.

DON (Wandoan)—

1. *Rhagodia nutans* (?). Specimen very decomposed, therefore determination rather doubtful. It is, however, one of the Saltbush family and represents one of the green species either as determined or an allied one. They are quite good fodders, relished by stock particularly when made into hay or when drying off somewhat. The only disadvantage is that they are apt to taint the milk of dairy cows, giving it a weedy or almost fishy flavour.
2. *Zygophyllum apiculatum*, Gall Weed or Twin leaf. I have never seen stock eat this plant, though it is not known definitely to contain any poisonous principles. It is exceedingly abundant in much of the ring-barked country on the Western Downs and parts of the Maranoa.
3. *Chenopodium album*, Fat Hen.
4. *Tetragonia expansa*, New Zealand Spinach. The young shoots and leaves of this plant are said to make quite a good spinach. We cannot say we have known stock take to it to any great extent. They prefer many of these succulent plants when they are drying off somewhat rather than when they are green and luxuriant.
5. This specimen is too decomposed for identification.
6. *Panicum queenslandicum*, a native Panic Grass. Most of the native Panic Grasses are quite good fodders.
7. *Eriochloa* sp. One of the so-called Early Spring Grasses. Excellent fodder and worth encouraging.
8. *Solanum aviculare*, Kangaroo Apple. A fairly common weed in parts of Queensland, both on the coast and for some little distance inland. The berries are poisonous. The young plants as they come up after a burn have been accused, and I think on good evidence, of poisoning sheep, though normally speaking stock avoid the plant.
9. *Cassia laevigata*, commonly called Arsenic Bush, though this name is rather misleading as the leaves when eaten are likely to purge stock but not to have any other effect. We think it would be just as well, if you only have a few bushes on your place, to destroy them.

Knot Grass or Knot Weed.

L. McG. (Bungeworgorai)—

Your specimen represents *Polygonum aviculare*, Knot Grass or Knot Weed, a plant widely spread as a weed of cultivation over the warm temperate regions of the world. It is quite a common plant on some of the farms of the Darling Downs. We have never heard of it causing harm to stock in any way, although it is possible that if the long wiry stems were eaten by them impaction would follow.

General Notes.

Staff Changes and Appointments.

Mr. R. W. Bambrick, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, has been transferred from Toowoomba to Hughenden.

Mr. G. B. Gallwey, Inspector of Accounts under the Dairy Produce Acts, Department of Agriculture and Stock, has been appointed also Inspector of Accounts under the Pig Industry Act.

The following additional appointments have been granted to Inspectors in the Department of Agriculture and Stock:—

Messrs. S. B. Myles, Stock Inspector, Wyalla; J. Wyvill, Stock Inspector, Nanango; A. F. H. D. Singh, Stock Inspector, Wondai; T. Douglas, Stock Inspector, Kingaroy; C. E. Ellis, Stock Inspector, Killarney; and R. T. Cridland, Slaughtering Inspector, Rockhampton; have been appointed also Inspectors under the Dairy Produce Acts.

Mr. M. D. O'Donnell, Dairy Inspector, Gympie, has been appointed also an Inspector under the Diseases in Stock Acts.

Mr. E. W. Ladewig, Dairy Inspector, Murgon, has been appointed also an Inspector under the Slaughtering and Diseases in Stock Acts.

Mr. J. V. Munck has been appointed Canegrowers' Representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. P. Kirwan, resigned.

The following have been appointed Honorary Rangers under the Animals and Birds Acts in the Clermont district:—Messrs. S. C. Fox, Manager of Batheaston Station; J. S. McCormack, Manager, Diamond Downs; K. McLean, Manager, Peak Downs; H. C. S. Griffin, Manager, Wolfang Station; H. A. Rickertt, Manager, Langton Downs; R. H. Griffin, Manager, Currajong Station; J. F. McKenzie, Manager, Moray Downs; R. O. Spenceley, Manager, Kilcummin Station; W. R. Tindale, Manager, Monteagle Station; H. K. Goodwin, Manager, Banchory Station; R. A. Mathieson, Manager, Logan Downs; and F. W. Kettle, Manager, Prairie Station.

Mr. C. R. Mulhearn, B.V.Sc., Veterinary Officer to the Division of Economic Entomology of the Council for Scientific and Industrial Research, Canberra, has been appointed a Government Veterinary Surgeon, Department of Agriculture and Stock, and will be attached to the staff of the Animal Health Station at Yeerongpilly.

The following transfers of officers of the Department of Agriculture and Stock have been approved:—

Mr. J. W. Winlaw, Stock, Slaughtering, and Dairy Inspector, from Brisbane to Boonah;

Mr. J. R. D. Munro, Dairy Inspector, from Warwick to Clifton; and

Mr. L. Moriarty, Dairy Inspector, from Clifton to Warwick.

Mr. A. M. Taylor, Clerk of Petty Sessions, Ayr, has been appointed Chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards in lieu of Mr. T. R. Kennedy, Police Magistrate, Bowen.

Constable F. Mawn, of Mount Surprise, has been appointed also an Inspector of Slaughter-houses.

Mr. R. A. F. Ives, of Upper Mudgeeraba, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

The following have been appointed Honorary Inspectors under the Diseases in Plants Acts:—

Messrs. G. J. McGee (Eulama), D. C. Haylock (Cootharaba), A. Braithwaite (Chinaman's Creek), W. R. Hayter (Ironstone Creek), and J. H. Lane (Middle and Skyring's Creeks).

Pure Tobacco Seed Districts Declared.

A Tobacco Pure Seed district embracing Marmor and Bajool, near Rockhampton, was declared by Order in Council of the 20th September last. It has since been recommended that an additional area be included, and an Order in Council under the Tobacco Industry Protection Act has been issued altering the boundaries of this district. The Archer district is now included.

Rural Topics.

Castration of Pigs.

There is no more important work associated with the raising and marketing of pork and bacon pigs than that of having animals of the right type in the primest of condition at the time they go forward to the factory or saleyard. With the knowledge that this simple surgical practice is essential in preparing male pigs for the meat market, and with the further knowledge gained from experience and observation that many beginners as well as many older farmers do not know how to perform correctly the operation of castration, the Senior Instructor in Pig Raising, Mr. E. J. Shelton, has dealt fully with the subject-matter and has presented detailed instructions in convenient form and in every-day language in a Departmental Pamphlet, "Castration of Pigs," now obtainable free of cost on application to the Department of Agriculture and Stock, Brisbane.

Summer Comfort for Pigs.

During the summer months the provision of shade for pigs is very essential. The ordinary sty, especially if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If no trees are present a wooden shed will answer the purpose.

Another important aid to the health and comfort of swine is the provision of a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pig-yards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area. Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard it is to be found in just this place.

Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished.

Waster—Or High Producer? Only the Tester can Tell.

All experience goes to show that it is futile to speak of the productive ability of a dairy cow except as proven by her test. When herd-recording was commenced it was contended by many farmers that they could tell what their cows were doing without putting them under record, merely by relying on outward appearances, such as body formation, the size of the milk veins, and size and shape of the escutcheon. There were those who knew the quality of milk by its colour, and others who could tell by its feel. The systems of judging were many and diverse. To settle the matter definitely for them it was arranged that when the recorders went their first rounds, members were to pick out on their own judgment the three best and three worst cows in their herds, and at the conclusion of the year's testing their selections were to be compared with the actual returns obtained as shown by the Babcock test.

Each member put his pick down on paper and handed it over to the tester. The results convinced all concerned that they were wrong in their contentions; the Babcock won all along the line. In not one case was an owner able to pick out without error his worst and best cows.

The majority were right out in their reckoning. In some cases those picked out as the worst proved to be among the highest yielders. One farmer thought so much of a cow that he had paid a fancy price for her and brought her at considerable expense some 200 miles to his farm on the Tweed. He thought her the best cow on that river, and certainly by appearance she was a top-notcher. She was first recorded six weeks after calving and gave one half-pound of butter for the twenty-four hours' milkings, the test being 1.9 per cent. fat. She was in good health and condition and feed was plentiful. The following month she just exceeded a quarter of a pound of butter for the day. The third month's test showed the day's butter production to be under a quarter of a pound. She gave a fair quantity of milk, but there was too little fat in it. She was soon culled out.—A. and P. Notes, N.S.W. Department of Agriculture.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

HOLIDAY TRAVELLING.

TRAVELLING with a baby and several small children is no holiday for their mother. Unless she plans everything carefully beforehand a long train journey may end with an exhausted mother and a handful of cross, tired, over-fed children, who will be sick for the next few days. Perhaps a little advice at this season of the year may be helpful.

Food.

It is most important that this should be carefully considered beforehand. The breast-fed baby, who has been properly managed, should give no trouble at all. But it is not so with the bottle-fed infant. We have seen many who have been seriously upset by milk which has gone bad in the train, especially in hot weather. It is true that there are ways of carrying the baby's milk safely; but these require so much care and understanding, and the consequences of any mistake may be so serious, that we cannot advise them. Nor can we advise the mother on a journey to buy milk at the railway stations. Much the safest plan is to carry a supply of good dried milk (Glaxo or Lactogen), not, of course, dried skimmed milk. Boiling water is always procurable, and it may also be carried in vacuum flasks, so that it is always possible to scald the bottles and teats and to make up the feeds for each meal. Any milk left after a feed should be thrown out at once, never left in the bottle. It is well to carry more than one bottle and teat. These should be wrapped in clean, boiled, butter muslin and carefully packed in a tin. Though the baby may not be used to dried milk, it will do him no harm, provided it is not made too strong. It will be wise to make it up rather weaker than advised on the tin. At the end of the journey, when good fresh milk is procurable, he will soon make up for having been on a rather weak mixture for one or two days.

For the toddler avoid bought foods, cakes, and sweets, which may do him much harm, especially as the novelty and excitement will very probably have weakened his digestion. Remember that a day of rather short rations will do him no harm, but a day of over-feeding may go a long way to spoil his holiday and your own, too. Carry your own provisions. Pack a tin with some slices of baked bread and oatcake, which may be ready buttered, and some sandwiches, preferably of brown bread. These may contain lettuce or silver beet, sliced tomatoes, egg (either sliced or scrambled), or soft cheese spread on butter, or marmite. Add a few dates and raisins, apples, and oranges, and you have all the solid food necessary. He may drink dried milk dissolved in hot water, like his baby brother, or you may carry one or two lemons with a small packet of sugar, which will make a drink he will surely relish. Let him have his little picnics at the right times, but don't try to keep him

quiet by feeding him all the time. You won't succeed; it will only make him cross and irritable, miserable himself and a torment to others; but let him have a drink of water when he wants it.

Amusement.

Most children will be interested in looking out of the window until they are tired, but don't let them tumble out. It may be well to carry a few simple toys and picture-books and writing-pad and a pencil.

Clothing.

You won't need to carry much wraps in the summer, but a light rug and cushion will be useful. For the baby have a plentiful supply of napkins, and some old newspapers or a mackintosh bag for the wet napkins.

Rest and Sleep.

These are important if over-fatigue and fretfulness are to be avoided. A dress-basket is most useful for a young baby. Properly managed he will sleep or lie awake in this quite contented, and much happier than if constantly nursed in the arms of an over-heated and exhausted mother.

If you have trained your children well you will reap your reward when travelling. How sad it is to see children in the train scrambling over everything, eating an endless supply of cakes and sweets, grubby and tired, ignoring their mother's efforts at control, and finally fretful and crying from sheer exhaustion and discomfort.

IN THE FARM KITCHEN.

The Orange—Food and Medicine.

"The apple is a most delightful fruit," said Professor V. H. Mottram, Professor of Physiology of the University of London, and an authority on foods, "yet it is only a sweetmeat and is negligible as nourishment or as a medicine. On the other hand, the orange is most valuable as nourishment, and medicinally. It is anti-scorbutic, and rich in the vitamin contained in sunlight. It also has calcium, which is essential to bone-building. Recent experiments indicate that oranges are nearly the equal of milk in nourishment."

Food Value of Bananas.

When it is considered that the banana is an article of diet in every country of the world, and that the inhabitants of some portions of the globe subsist on it almost entirely, it is strange to find some people under the impression that bananas should be eaten sparingly and only by people with good digestion, runs the introduction to the banana recipe booklet issued by the Commonwealth Banana Committee.

It is true that the banana, eaten in an *unripe* state, will, in common with all fruits, cause intestinal disturbance to a greater or less degree. The *ripe banana*, however, is not only a fruit of remarkably high food value, but is amazingly easy to digest. It can be eaten with safety and relish by everyone from infancy onwards.

No fruit compares with the ripe banana in food values; no fruit approaches it in regard to digestibility and easy assimilation; no fruit and very few foodstuffs approach it in regard to value for money expended. Writing of the banana, Professor S. C. Prescott (Massachusetts Institute of Technology) says: "The ripe banana contains all the classes of food materials required for the human body. Although the amounts of protein and fat are slightly too low to constitute a perfectly balanced ration, the combination of bananas with milk, or its utilisation to supplement a diet containing a small amount of meat will produce a ration which is ample to take care of the body needs."

Summer Salads.

Tomatoes with chopped parsley and young onions.

Tomatoes (small) peeled and quartered, with diced cucumber, pieces of cheese, hearts of lettuce, moulded spinach, diced beetroot, and sliced egg.

Asparagus tips, chopped tomato, and broken cauliflower.

Diced beetroot with watercress, shredded cabbage or lettuce, cauliflower separated into flowerets with quartered hard-boiled eggs.

Diced cold boiled potatoes, finely-chopped onion, chopped celery, salt.

Cucumbers cut lengthwise and steamed until tender. Scoop out the seeds and fill with prawns or lobster mixed with mayonnaise. Serve these cucumber boats on lettuce. Decorate with whole prawns and sliced olives.

Red Heart Salad.—Set tomato jelly in a shallow pan and cut with a heart-shaped pastry cutter, arrange with hearts of lettuce.

Artichokes cooked and quartered served with thinly sliced oranges and chopped celery.

Stuffed Beets.—Scoop out the centre and fill with chopped cucumber, radishes, celery, and olives mixed with dressing.

Stuffed Tomatoes.—Scoop out the centre and fill with chopped tomato pulp, diced cucumber, salt, pepper, a little grated horse-radish and dressing, or chopped tomato, celery, raisins or sultanas, a very little green onion, a finely chopped sour apple, and dressing.

Chopped tomato, cucumber, cooked sweet bread (any white meat may be used instead), salt, pepper, capers, with dressing.

A Way of Serving Tomatoes.—Cut in halves and put together again with a layer of cream cheese, seasoned and moistened with salad dressing. Top with a sprig of parsley.

Banana, beetroot, cucumber, grated nut, and lettuce.

Orange, tomato, beetroot in mayonnaise jelly; serve on lettuce.

Pineapple, tomato, cheese in mayonnaise jelly; serve on lettuce.

Apple, celery, parsley, walnut, on lettuce.

Beetroot and green peas in mint jelly.

Combination Salad.—Tomato wedges, sliced cucumber, onion rings; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

Green Vegetable Salad.—Cooked string beans and peas, diced cucumber, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

Chiffonade Salad.—Cubes of cooked beetroot, sliced hard-boiled eggs, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with mayonnaise.

Carrot and Cabbage Slaw.—New carrots, cut in long fine strips; cabbage finely shredded mixed with vinegar; combine carrots and cabbage by tossing together lightly with salad dressing; serve thoroughly chilled.

Golden Glow Salad.—Diced pineapple, grated raw carrot, grated nut; on lettuce with mayonnaise.

Other Salads.—Macaroni salmon, sliced egg and minced onion; served on lettuce.

Baked apples, served with nuts and raisins on lettuce, garnished with currant jelly and mayonnaise.

Grapefruit and orange sections arranged on lettuce with fine strips of dates and figs; dressing.

Celery, cheese, and pineapple on lettuce; serve with dressing.

Pears and Asparagus Salad.—Half a pear for each serving; four or five asparagus tips, salt and pepper, and dressing; serve on lettuce.

Jellied Mayonnaise.—Any salad vegetables may be set in mayonnaise jelly, the recipe for which is as follows:—

Ingredients.

3 teaspoons gelatine.
3 tablespoons condensed milk.
2 dessertspoons vinegar.
1 egg (hard-boiled).
½ teaspoon mustard.
1 teaspoon sugar.
½ teaspoon salt.
½ cup hot water.

Method.

Crush yolk of egg and sugar together in a basin, add mustard, salt, pepper, vinegar, and milk. Mix all thoroughly together. Dissolve gelantine in hot water, add to other liquid and blend. Pour on to prepared salad ingredients.

Poison in Paint—Danger to Children.

Lead-poisoning is by far the most common cause of the frequency of nephritis in Queensland, in the opinion of Dr. L. J. Jarvis Nye, of Brisbane, who, in his book "Chronic Nephritis and Lead-poisoning," urges the complete prohibition by law of the use of lead paint.

Dr. Nye gives figures to show that the increased death rate from chronic nephritis among young people in Queensland is a tragic reality, presenting an important field for research. Since 1928 he has been able to produce evidence that lead-poisoning in childhood has played an important part in causing the increased mortality.

"Of 87 patients questioned by me 71 said the paint on the verandas of houses occupied by them in their childhood was dry and powdery," he writes. "Forty-six were nail-biters or thumb-suckers, and in seven cases the parents said the child had been in the habit of licking raindrops from the veranda railings. Obviously the majority had been exposed to the risk of lead-poisoning."

Dr. Nye finds no support for suggestions that the frequency of nephritis in Queensland is traceable in any considerable degree to chronic tonsilar infection, syphilis, measles, diphtheria, malaria, or filaria, or to climatic conditions.

Investigating the possible sources of lead-poisoning, he dismisses the theory that the town water supply might be responsible to some extent, and comes to the conclusion that the most likely source is the paint on the walls of the houses and on the railings of the verandas. He attributes the lessening of the incidence of plumbism in Queensland to the education of the public on the subject, the legislative prohibition of the use of lead paint on veranda railings, the earlier recognition and treatment of cases by medical men, improved hygiene in the home and at school, the work of the Creche and Kindergarten Society, a change in the type of houses, and the introduction of an enormous number of non-poisoning paints.

Orchard Notes for February.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkept, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in

which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well-filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded, and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Furthermore, growers in the Stanthorpe district are reminded that luring the adult flies constitutes an important part of the present fruit fly campaign.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.,	No. of Years' Records.	Nov., 1934.	Nov., 1933.		Nov.,	No. of Years' Records.	Nov., 1934.	Nov., 1933.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	2·28	33	8·42	5·14	Clermont	2·07	63	2·20	7·60
Cairns	3·95	52	5·12	14·04	Gindie	2·08	35	..	3·99
Cardwell	4·12	62	8·46	11·48	Springsure	2·17	65	6·17	6·72
Cooktown	2·56	58	3·38	2·45					
Herberton	2·56	48	6·26	6·01					
Ingham	3·90	42	5·81	13·81					
Innisfail	6·39	53	4·92	23·65					
Mossman Mill	4·52	21	5·48	9·50	*Darling Downs.*				
Townsville	1·89	63	3·06	5·86					
Central Coast.					Dalby	2·78	64	5·46	7·16
					Emu Vale	2·78	38	2·55	6·19
					Hermitage	2·75	28	..	5·29
Ayr	1·70	47	6·70	5·02	Jimbour	2·54	46	7·11	7·84
Bowen	1·29	63	2·13	3·57	Miles	2·63	49	4·86	9·05
Charters Towers	1·47	52	1·23	2·92	Stanthorpe	2·77	61	2·52	5·41
Mackay	3·15	63	3·38	13·65	Toowoomba	3·37	62	3·65	8·45
Proserpine	2·92	31	6·05	10·81	Warwick	2·67	69	2·25	5·45
St. Lawrence	2·36	63	8·86	7·89					
South Coast.									
Biggenden	2·81	35	5·76	5·80	*Maranoa.*				
Bundaberg	2·53	51	13·93	6·66					
Brisbane	3·81	83	5·68	8·41	Roma	2·13	60	7·40	3·29
Caboolture	3·49	47	8·25	8·30					
Childers	2·79	39	5·78	7·82					
Crohamhurst	4·34	40	7·97	11·89					
Esk	3·28	47	4·05	7·44					
Gayndah	2·95	63	7·32	6·38					
Gympie	3·24	64	7·73	9·77	*State Farms, &c.*				
Kilkivan	2·58	55	5·04	4·50					
Maryborough	3·22	63	5·77	8·84	Bungeworgorai	2·24	20	8·39	4·24
Nambour	4·05	38	7·42	14·87	Gatton College	3·03	35	2·83	11·15
Nanango	2·71	52	7·50	6·87	Kairi	2·29	20	..	4·88
Rockhampton	2·39	63	7·02	5·14	Mackay Sugar Experiment Station	2·89	37	3·81	11·82
Woodford	3·25	47	7·29	7·13					

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—NOVEMBER, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·85	87	70	91	18	61	3	338	10
Herberton	..	83	63	89	15,16,17	56	23	626	12
Rockhampton	29·93	86	68	93	10	61	1	702	13
Brisbane	30·00	79	64	88	14	58	4	506	12
Darling Downs.									
Dalby	29·95	82	60	89	7, 26	52	3	546	12
Stanthorpe	..	74	52	83	26	39	18	252	12
Toowoomba	..	76	57	85	11	49	18	365	13
Mid-Interior.									
Georgetown	29·86	98	71	103	17	61	23	474	7
Longreach	29·85	97	69	108	26	58	11	60	2
Mitchell	29·92	86	60	94	5	50	10, 11	525	11
Western.									
Burketown	29·84	97	77	105	16, 29	71	2, 24	15	1
Boulia	29·85	96	71	107	28	58	12	..	..
Thargomindah	29·87	89	67	107	29	55	10	121	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1935.		February. 1935.		Jan., 1935.	Feb., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·0	6·50	5·25	6·46	12·50	2·10
2	5·1	6·50	5·26	6·45	1·31	3·16
3	5·1	6·50	5·27	6·45	2·26	4·26
4	5·2	6·51	5·27	6·44	3·28	5·41
5	5·2	6·51	5·28	6·43	4·35	6·46
6	5·3	6·51	5·29	6·43	5·41	7·56
7	5·3	6·51	5·30	6·42	6·52	9·1
8	5·4	6·52	5·30	6·42	8·3	10·7
9	5·4	6·52	5·31	6·41	9·6	11·8
10	5·5	6·52	5·32	6·40	10·13	12·13
					p.m.	p.m.
11	5·6	6·52	5·33	6·39	11·15	1·12
					p.m.	
12	5·7	6·52	5·33	6·39	12·17	2·9
13	5·8	6·52	5·34	6·38	1·18	3·3
14	5·9	6·51	5·35	6·37	2·20	3·52
15	5·10	6·51	5·36	6·36	3·18	4·36
16	5·10	6·51	5·36	6·36	4·14	5·14
17	5·11	6·51	5·37	6·35	5·5	5·46
18	5·12	6·51	5·38	6·34	5·54	6 18
19	5·13	6·51	5·39	6·34	6·37	6·48
20	5·14	6·50	5·39	6·33	7·14	7·17
21	5·15	6·50	5·40	6·33	7·47	7·45
22	5·16	6·50	5·41	6·32	8·18	8·13
23	5·17	6·50	5·42	6·31	8·44	8·48
24	5·18	6·50	5·42	6·30	9·13	9·24
25	5·18	6·49	5·43	6·29	9·42	10·6
26	5·19	6·49	5·43	6·28	10·13	10·56
27	5·20	6·48	5·44	6·27	10·46	11·53
28	5·21	6·48	5·44	6·26	11·26	..
29	5·22	6·47			a.m.	
30	5·23	6·47			12·12	
31	5·24	6·46			1·6	

Phases of the Moon, Occultations, &c.

5 Jan.	●	New Moon	3	20 p.m
12 „	☾	First Quarter	6	55 a.m.
20 „	○	Full Moon	1	44 a.m.
28 „	☽	Last Quarter	5	59 a.m.

Perigee, 6th January, at 9.42 p.m.
Apogee, 22nd January, at 8.0 a.m.

Orion comes into view about an hour after sunset on the 1st and rises 4 minutes earlier each evening. The Great Square of Pegasus, being 6 hours earlier, will be on the Meridian at the times mentioned. The Scorpion dissapears over the western horizon almost as Orion comes over the eastern.

On the 2nd the Earth will arrive at that part of its orbit which is nearest the Sun, which will then be at a distance of 91,330,000 miles, but it will not be so near our zenith at midday as on 23rd December by nearly one-half a degree.

The occultation of Antares by the Moon will take place about 5 a.m. on the 3rd if the observer is north of parallel 20 in Queensland. An interesting spectacle will be afforded for those further south, where the star may be seen to skirt the edge of the Moon much in the same way that it did on 15th September last, when (after the voting was over) a very interesting sight was afforded by the Moon and the same star.

A very slight partial eclipse of the Sun will occur on the 5th far south in the western hemisphere near the Antarctic circle. So slight will the eclipse be that only one-thousandth of the Sun's face will be obscured by the Moon. In Queensland no part of it will be obscured; in fact, the Moon will pass about 1 degree from the Sun on its southern side. As a corollary to this eclipse, a fortnight later, on the 19th, when the Moon is full, it will become eclipsed in the shadow of the Earth. Commencing, technically, at 10.38 p.m., it will not be till 11.53 that the Moon will reach the darker part of the Earth's shadow and become noticeable. One hour three minutes later it will be totally immersed, and according to the state of the Earth's atmosphere near the eastern or western horizon, it will become more or less lost to view. It frequently happens that bent rays of sunlight reach the Moon in sufficient quantity to make it clearly visible all through what is called a total eclipse. Rarely does a black eclipse occur when the Moon can hardly be seen.

On the 8th, about midday, Saturn, with the Moon about 4 degrees from it, may be seen in a north-easterly direction by observers having a telescope or binoculars.

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4 Feb.,	●	New Moon	2	27 a.m.
10 „	☾	First Quarter	7	25 p.m.
18 „	○	Full Moon	9	17 a.m.
26 „	☽	Last Quarter	8	14 p.m.

Perigee, 4th February, at 9.24 a.m.
Apogee, 18th February, at 9.12 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.